

DECEMBER 24, 1956 50 cents

# AVIATION WEEK

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PUBLICATION

RB-66B Flare Pattern

**Beech Sales Goal  
Is \$46 Million**

**Three Autopilots  
Guide Vanguard**



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ICE—real its attendant hazards—have, since the beginning of flight, impeded the progress of all-weather flight. Now, when our very survival may depend upon aircraft able to fly in any weather, comes the modern solution to this age-old problem—the Iceguard by Goodyear.

Here is fully proved, foolproof ice protection for aircraft—for propellers, wings, empennage—for ice rings, antennae, pipe and cowlings—for any surface—any size, any shape.



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No matter what the size, no matter how complex the contour, no matter how tough the problem—here is fully automatic, electrothermal ice protection with the Iceguard by Goodyear—being a pioneer in aviation.

For details write: Goodyear, Aviation Products Division, Akron 16, Ohio, or Los Angeles 54, California.

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## AVIATION CALENDAR

**Dec. 20/Nov./Thru: King George Island**  
West Malli Place Court, U. S. Marine  
Camp Air Station, Miami, Fla.  
Jan. 4-9, 1987-140 Special Marine Forces  
Air Group, sponsored by Florida Air  
Photo Area. For details visit James G.  
Pepe, cruise director, FAX: 318 S.E. 2d  
Ave., Miami, Fla.

**Jan 14-16—National Symposium on Reliability and Quality Control in Manufacturing** sponsored by IEEE, ASQC, VEE, and KITAIA, Hotel Sheraton, Orlando, Jan. 14-16.

Jan. 29-32—Symposium on Solar Farms: Design and Operations. Hotel Warwick, Ho. Plenum, Ariz.

Box 2729—American Society for Metals,  
Albuquerque and Los Alamos Chapters,  
1000 University Blvd., Albuquerque  
Auditorium, Albuquerque, N. M.

Jan. 18 10-5th Plant Maintenance & Repair  
meeting Conference, Public Auditorium,  
Cleveland, Ohio

Jan 28 31—77th Annual Meeting, Institute of the Aeronautical Sciences, Houston-Solera Hotel New York N. Y. Dinner-Night Dinner Jan 28

Jm. Yi-Seok, Seoul Instrument Shop  
 Corner, Los Angeles Harbor Forum  
 College, Wilmington, Calif. Additional

Feb. 48—N. E. Dickinson School, North  
Sussex, Phillips Co., 710 S. Fulton  
Ave., Mt. Vernon, N. Y.

Feb 7—Opportunity Research Symposium  
University Museum Lecture Hall, Uni-  
versity of Pennsylvania Philadelphia, Pa.

Feb. 7—Annual Mid-Winter Symposium of the New York Section, Inghamston Society of America, Garden City Hotel Long Island, N. Y.

Feb. 14-15-1967 Toronto and Solid State  
Gersoni Conference, University of Toron-  
to, Ontario, Philadelphia Pa.

Feb. 26-28—Western Joint Computer Conference, sponsored by IBM, MIT, and ACM, Hotel Statler, Los Angeles, Calif.

Mr. 14-43—1957 Atomic Exposition, as

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AVIATION WEEK • DECEMBER 24, 1956  
Vol. 43, No. 24

Additional results with an additional focus on responses to the question "What is the most important factor in your decision to use a mobile phone?" are available in the Appendix. The Appendix also includes a table of the mean and standard deviation for each of the 10 items used in the survey. The Appendix also includes a table of the mean and standard deviation for each of the 10 items used in the survey.

[illegible]

The Chance-Vought Regulus taken to the air. Precision-studying assemblies for B-5 and other guided missiles are part of In-Cad Co's production.

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## Globe Aerostatique...1783

### Montgolfier's vanguard project

A sheep, a duck, a rooster—the first payload carried aloft for atmospheric research. Louis XVI, his court and his court, were astonished witnesses as Joseph Montgolfier's smoke-filled balloon rose in majesty 1500 feet over Versailles. The passengers? unharmed (except the rooster, locked by the sheep).

Project Vanguard, 1957, is an equally momentous "first"—an attempt to place a 21-pound satellite in an orbit 300 miles up. Aerojet-General, designer-builder of the famed Aerobee-H, will supply vital second-stage propulsion systems for Vanguard launchings during the International Geophysical Year.



Aerojet-General invites scientists and engineers—men of imagination and vision—to join the attack on the most significant research, development and production problems of our time.

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The International Geophysical Year is a period of intensive research devoted to the earth and its surroundings. Aerojet-General research facilities will play a major role in IGY. In addition to Project Vanguard's gas jet propulsion system, Aerojet will supply its liquid rockets in rockets to conduct research flights from station day.



Whether you interest lie in Vanguard or Vela, Aerojet-General offers a variety of engineering experiments for:  
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Mathematicians  
Technical Editors



Write: Director of Scientific and Engineering Personnel, Box 25040, Azusa, Calif. or Box 17009, Sacramento, Calif.

Conference and 10th Year Laboratories & Equipment Conference, Convention Hall, Philadelphia, Pa.

Mar. 14-15-16th Pacific Meeting, (Closed) sponsored by IAS, Hotel Copley Cleveland, Ohio

Mar. 18-21-Pacific Coast Physics Exposition, in conjunction with The Society for Plastic Industry National Conference, Sheraton Hotel, Los Angeles

Mar. 18-21-National Convention, Institute of Radio Engineers, New York Coliseum and Hotel Waldorf Astoria, New York, N. Y.

Mar. 18-21-151st Annual Meeting of the American Meteorological Society, University of Chicago

Mar. 24-27-Southern American Technical Meeting and Convention, American Society of Tool Engineers, Sheraton Hotel, Houston, Texas

Mar. 28-29-Western Metal Congress and Exposition, Anaheim Hotel and Executive Conference, Anaheim, California

Mar. 21-26-Educational Conferences on Radiation Effects on Materials sponsored by ORNL and Glue L. Martin Co., Johns Hopkins University, Baltimore, Md.

Apr. 8-12-15th World & Glass Industry Exposition, Convention Hall and Hotel Marlborough, Philadelphia, Pa.

Apr. 16-18-Symposium on Nondestructive Tests in the Field of Nuclear Energy, Vancouver, British Columbia, Canada

Apr. 17-18-18th Annual Conference of the Solid State Society, including symposium and display, Hotel New Yorker, New York, N. Y.

Apr. 24-25-Second National Industrial Research Conference, sponsored by American Association, Philadelphia, General Hotel, Hotel Chicago, Ill.

Apr. 25-May 3-American National Materials Handling Exposition, Convention Hall, Philadelphia, Pa.

May 1-3-Spring Meeting and Exhibit, Society for Experimental Stress Analysis, Hotel Statler, Boston, Mass.

May 14-15th Annual Meeting, Aero Mach. Soc., Sheraton Hotel, Denver, Colo.

May 24-June 2-22nd First Air Show, Society of French Aircraft Constructors, La Bourget Airport, Paris

June 1-3rd First Annual National Aviation Trade Show, Massachusetts County (N. 1) Airport

June 25-26-27th Annual Meeting, Aviation Distributors & Manufacturers Assn., The Renaissance, Colorado Springs, Colo.

July 6-10-15th Annual All-Union Exposition International Air Race, sponsored by Union of Soviet Republics, Aeroflot, San Carlos, Calif. to N. Philadelphia Airport, Pa. For details write: Headquarters, AVIAR, 2811 E. Spring St., Long Beach 5, Calif.

Aug. 20-23-Western Microwave Show, in conjunction with the Western Computer Show, San Francisco, Calif.

Sept. 1-16-16th International Symposium on Composites, Royal Astronomical Society and Institute of the Astronomical Sciences, Tokyo and London, England

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Mocon, 200-A, uses an input of 10,000 ohm resistance potentiometer as an input transducer providing 10 to 3 scale expansion and output positioning. Available standard dual input operation are essentially inputs of this type. Air resistance potentiometer will provide an output input for this configuration.

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## F105 Sets New Speed, Altitude Marks 28

► Tiger equipped with G.E. 179 turbo 1,230 mph., reaches 72,000 ft. Common wealth editorial lrp.

## Polar Route Shows Market Potential 36

► CAB estimates, recommending Pan American and TWA for service, estimates 75,000 passengers annually.

## Boech aims for Sales of \$46 Million 72

► Presentation of 1837 models includes supercharged Twin-Bonnet, other designs.

## Three Antipollers Will Ride Vanguard 54

► Vehicle uses thrust deflection, not controllable fins, on first, second stages.

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<b>Boeing 747-9400</b>	75	<b>Boeing 747-9500</b>	86
<b>Boeing 747-9600</b>	76	<b>Boeing 747-9700</b>	87
<b>Boeing 747-9800</b>	77	<b>Boeing 747-9900</b>	88
<b>Boeing 747-10000</b>	78	<b>Boeing 747-10100</b>	89
<b>Boeing 747-10200</b>	79	<b>Boeing 747-10300</b>	90
<b>Boeing 747-10400</b>	80	<b>Boeing 747-10500</b>	91
<b>Boeing 747-10600</b>	81	<b>Boeing 747-10700</b>	92
<b>Boeing 747-10800</b>	82	<b>Boeing 747-10900</b>	93
<b>Boeing 747-11000</b>	83	<b>Boeing 747-11100</b>	94
<b>Boeing 747-11200</b>	84	<b>Boeing 747-11300</b>	95
<b>Boeing 747-11400</b>	85	<b>Boeing 747-11500</b>	96
<b>Boeing 747-11600</b>	86	<b>Boeing 747-11700</b>	97
<b>Boeing 747-11800</b>	87	<b>Boeing 747-11900</b>	98
<b>Boeing 747-12000</b>	88	<b>Boeing 747-12100</b>	99
<b>Boeing 747-12200</b>	89	<b>Boeing 747-12300</b>	100

## MANAGEMENT

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## BUSINESS FLYING

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THE  
VICKERS

# VISCOUNT

How famed turbo-prop aircraft  
are working for

TCA



**LOWEST**  
break-even "load factor"

TCA has found the break-even load factor with the turbo-prop Viscount to be the lowest of any aircraft they serve—50%. By adding 24 seats on each flight, TCA can serve all direct routes of their Viscount operation (including overland)—such as Los, San Francisco, Reno-Tahoe, Seattle and Spokane, Minneapolis, Denver and Montreal including passengers.



**HIGHEST**  
average "seats sold"

Trans-Canada Air Lines' Viscounts have met with unprecedented passenger approval. As a result, passenger traffic has soared—and the average passenger load factor on TCA Viscounts in the first months of 1961 was a remarkable 85% of... 71 out of 84 seats sold.

TCA reports the Vickers Viscount is a "most economical aircraft." The combination of this low break-even load factor (based on direct routes) and high actual "seats sold" average has made the Viscount a record-breaking success in

TCA operation. TCA's experience with the turbo-prop Vickers Viscount is typical of dozens of other airlines throughout the world. United States House Representative Christopher Clark, of Rocky Hill, Conn., N. Y.

turbo-prop  
VICKERS

**VISCOUNT**  
POWERED BY FOUR ROLLS-ROYCE DART ENGINES

VICKERS-ARMSTRONG AIRCRAFT LTD. WYVERN, ENGLAND • MEMBER COMPANY OF THE VICKERS GROUP

## EDITORIAL

### Ostrich Heads in the Sand

On page 15 of this issue, we are publishing a picture of part of the crowd of 3,000 people, many of them equipped with cameras, who witnessed the last flight of the Convair 440B turboprop aircraft on October 21, 1960. The people were watching the flight of a large 140,000 lb. gross weight aircraft—usually from public property adjoining the airport. This was a sign to the public of the end of an era in aviation. At the same time, the people were also the first to see the aircraft after its last flight. The Defense Department has not yet released photographs of the aircraft.

On page 15 of this issue we report on the performance of two U.S. manufactured turboprops—the Convair 440B and the Lockheed P-3B—both of which are capable of matching the speed and altitude records for their category. The general performance history of these two aircraft are so secret that they are not even mentioned in the Defense Department's official records. Yet the Defense Department is still officially protesting that the general performance characteristics of these aircraft are secret.

Several weeks ago, the Defense Department released for more than 24 hours to confirm the fact that a Northrop Starfighter turboprop had failed to respond to guidance controls and continued on a 3,000 mile flight until it crashed in Israel. The Defense Department (no comment) issued after the separate publication of the story in the New York Times. The Defense Department also said that the Starfighter was out of control at 40,000 ft altitude in a specific area where there had been a severe weather system.

All of these incidents are characteristic of the ostrich-like attitude by Department of Defense level public relations officials who compulsively bury their heads in the sand while the facts fly overhead. It is a task of the Defense Department to keep the public out of the Defense Department—far above the level of individual military services—that has caused almost universal contempt for their policies and general disregard of their actions by the writing press.

The three examples cited above are just the most recent and most frequent disregard of reality by Defense Secretary Wilson. A public relations staff in the Department of Defense is responsible for the Department's policy to keep the public out of the Defense Department—far above the level of individual military services—that has caused almost universal contempt for their policies and general disregard of their actions by the writing press.

During the past several years, there has been a variety of governmental groups investigating the alleged "leak" of military secrets in the public press. Each group set out on a different mission. Some felt that the leak of military secrets would solve the problem. And the inter-

ventions are certainly belated and chivalrously by the Pentagon public relations departments and even the middle ranks of second line executives must appear to be top secret. Some felt that the leak of military secrets would solve the problem. And the inter-

ventions are certainly belated and chivalrously by the Pentagon public relations departments and even the middle ranks of second line executives must appear to be top secret. Some felt that the leak of military secrets would solve the problem. And the inter-

### Expansion in Southwest

As a result of the expansion in the Southwest, the Department of Defense is now expanding its operations in the Southwest. The Department of Defense is now expanding its operations in the Southwest. The Department of Defense is now expanding its operations in the Southwest.

The Southwest is now expanding its operations in the Southwest. The Department of Defense is now expanding its operations in the Southwest. The Department of Defense is now expanding its operations in the Southwest.

Establishment of an American West editorial office in the Dallas-Ft. Worth area is recognition of the growing importance of Texas and the Southwest to the future of aviation. With such press firms as Chance Vought, Textron, Convair, Bell Helicopter Corp., Bell Aircraft, Lockheed, Southwest Airlines, Dallas American and others already operating in the area and the expansion in business flying and aviation and military activities, there is little doubt that the Southwest is destined to play an important role in the future of aviation. And American West will be there to provide news of the on-the-spot type of coverage by staff reporters that has made it the leading publication in its field.

—Robert Hots











## BENDIX DUAL GENERATOR SYSTEM HELPS MAKE LOCKHEED F-104 WORLD'S FASTEST FIGHTER

### Jet-Age Advantages Offered By Bendix System

High-temperature AC generators: 28 KVA, 400-cycle, 3 phase unit operating in 4800 to 7200 rpm range. Generators 120/208 volts. Exceeds Class "C" military requirements. Advanced design, including oriented exciter, permits taking very heavy intermittent loads "in stride". Driven directly by engine for increased reliability, less maintenance, overall weight savings.

Magnetic amplifier voltage regulator. Completely static design eliminates all moving parts. Silicon rectifier elements operating efficiently uncontrolled at high temperatures. Special vibration resistant construction elements need no vibration isolators and thus conserve critical space.

Automatic control panel. Mechanically sealed, environmental-free unit provides complete system control. Pilot operates entire automatic system from single toggle switch.

Supplying electrical power to the Air Force's top-performing Starfighter is a job calling for all-out performance and reliability.

The Bendix AG generator setup aboard the F-104 is a dual system, with either system able to handle the entire electrical load alone, if necessary. Developed by Bendix Red Bank Division, the system has many advanced features and advantages (see adjoining column) that enable it to answer the many difficult problems arising from the complex needs of an airplane that can climb with the speed of sound.

Our experience, manpower and facilities have produced many "firsts" and "bests" in the aircraft generator system field. Perhaps you can raise up with a better answer to your needs. See Red Bank Division, Bendix Aviation Corporation, BARTONVILLE, NEW JERSEY.

Sales and Service: 117 E. Broadway, Jackson, Mich. 49201  
Export Sales and Service: Bendix International Division, 195 E. 42nd St., New York 17, N.Y.

Consulting Affiliates: Aviation Electric Inc., P. O. Box 1940, Montreal, Quebec.

Red Bank Division



## Washington Roundup

### Missiles and Fiscal '68

Most debate in recent Congress concerning USAF's Fiscal 1968 budget plan was made last week by Chief of Staff Norton P. Twining, who said 55% of Air Force procurement money will be spent on missiles. By 1961, Twining anticipates that the split will be 50-50 between aircraft and missiles. Obviously, the budget reflects more rapid development progress and increased production order by missiles. By Fiscal 1967, \$1.5 billion was allotted for the procurement of missile weapons.

Gen. Twining is expressing increasing concern over the challenge missiles now offer the Air Force as the true score when this must be fully integrated into combat units. One problem, he said, "will be one of when and how to substitute missiles for aircraft without endangering our security at any time along the line. Just as new aircraft have led us in certain changes in our navigation structure, it is now clear that missiles will cause the need for entirely new structures."

### Pyle, CAA Administrator

Look for White House announcement of the appointment of James T. Pyle as Administrator of the Civil Aeronautics Administration. Pyle, who has been serving as acting administrator since the death of Charles Larson last September, had not figured strongly as a candidate for the post although he served as legislative counsel to the CAA three years prior to being named as one of the chief advisors behind the appointment. He was named deputy assistant to Larson on March 28 after serving as special assistant to the Assistant Secretary of the Navy for Air until 1955. A graduate of Gannon School and Princeton University, Pyle holds a commercial pilot's certificate and has logged more than 4,800 hours in single and multi-engine aircraft. He also has completed courses in air law, mechanics, meteorology and air transportation.

### White House Squeeze

Watch for increasing pressure from the U. S. government to restrict the competitive advantage of European aircraft at the expense of U. S. Big game airplanes over the North Atlantic. Pressure comes directly from the White House where President Lyndon B. Johnson is deeply concerned with increasing the dollar earning capacity of European allies but he is in the face of Congress. Among the first indications of this new policy will probably be regulations to sell U. S. Boeing 747s to airlines in Europe, Japan, Hong Kong and Los Angeles (AW Dec. 10, p. 25).

### Trans American, Another Blow

Trans American Airlines lost the next to the last round in its struggle to stay in business last week when the Court of Appeals upheld the Civil Aeronautics Board's decision of July 1957, to revoke the operating authority of the Trans American Laramie. The consolidated circuit will also rule on a suit brought to force its withdrawal into an appeal to the Supreme Court.

The court upheld the CAB on all points of contention, finding that Stanley D. Weiss, James Freidgrader, Jack B. Levin and K. R. Hart constituted the Trans American members and that the Trans American carriers banded together to operate an integrated, stipulated service. The court agreed with the CAB that the non-stop operation violates several sections of the Civil

Aeronautics Act and found that the Board had ample authority to order revocation.

Trans American's efforts to disqualify CAB members Thomas D. Deane from participation in the case have been rejected by the Board, and the court supported its action. The court's contention that it was substantially denied access to necessary CAB documents also was rejected by the court.

### Traffic Control Policy

The White House is expected to receive recommendations from various sources on traffic control and airway policies this week. May 3 from Edward Gerts, presidential assistant for Aviation Facilities Planning Group. Various items will have proposals for facilities from engineers and manufacturers in and between, and then submit their recommendations to Gerts. The General Aviation Facilities Planning Group will submit a study of its studies to Gerts in February. Report to President Eisenhower will be in three sections—equipment, facilities and administration. The latter section is likely to include the most drastic recommendations since Gerts feels that manufacturers can be expected to be subjected to changing requirements, but that the number of personnel organization must be fine enough to maintain rapid control of the overall system on a long range basis.

### Write and Rewrite

Rep. John Moss (D-Calif.) chairman of the House Government Information Subcommittee, has asked Defense Secretary Charles E. Wilson to give a "comprehensive" explanation as to why the Defense Department's Office of Systems Research wanted that changes be made in a speech USAF Secretary Donald A. Quarles made to deliver on May 15 when the scheduled speech aboard had been delayed, without the change, he delivered on March 15. Quarles' remarks, with changes, are to be changed upon by OSR.

Each time the Soviet Defense Minister claimed OSR caused out claimed and wrote about it "as necessary" that the Soviet Union was now "protected by defense science and technological progress, powerful combat personnel and all personnel resources of various types, including long range missiles." He mentioned OSR caused out "manned aircraft" and wrote it "claimed" that the new have been OSR caused out "both" the reasons and the fact that the OSR caused out the reason to deliver nuclear and technological knowledge against the Continental United States in the event a new conflict broke out OSR deleted "in the event a new conflict breaks out."

### Missile Guiding Station

New agreement has been reached with Brazil on the lease of the island of Fernando de Noronha in the South Atlantic, in order to extend the Air Force's guided missile tracking station. The station is located near USAF's launching site at Patric, AFB Fla. 1,800 miles south to Accra, Brazil. Fernando de Noronha, about 4,000 miles from Patric, was the last node in developing the track, today open. The agreement with Brazil is subject to final approval by the Brazilian government after the personal intervention of President Eisenhower.

—Washington staff





MODIFICATIONS of F11F with J79 installation include large engine inlet ducts. Single-piece clear windshield was added.

## F11F Sets New Speed, Altitude Marks

**Tiger equipped with G.E. J79 hits 1,230 mph., reaches 72,000 ft. Grumman wants official try.**

By Robert Holtz

Washington—Grumman F11F-1F Tigers 44-444 powered by a General Electric J79 turbojet has established a new world speed and altitude record. The aircraft was built by the British aircraft.

The Tiger, built for the Navy as a carrier-based fighter, has flown slightly more than 1,230 mph (Mach 1.31) in level flight at 40,000 ft. and has reached an altitude of more than 72,000 ft. World speed record is 1,112 mph set by the Honeywell D-12 research plane in North Atlantic. The aircraft was built by the British aircraft.

The National Aeronautics Association has announced the Grumman Aircraft and Engineering Corp. to make an official attempt on both the speed and altitude records. According to NAA test rules, this machine gives the Tiger a 90-day period in which to make these official runs before another U.S. contender would be permitted to try.

### F-104 Also Contender

The other leading contender for both speed and altitude records is the Lockheed F-104A, fighter, also powered by the General Electric J79 and being produced for the Air Force. F-104A's initial performance has been in the same vicinity as the F11F but Lockheed

has not yet requested official record runs from NAA.

Current U.S. speed record is 1,055 mph. set by the Chance Vought F9F Cougar, also being built for the Navy as a carrier-based fighter. The F9F's U.S. speed record was made to win the Thompson Trophy last summer after an earlier attempt to set the first "over 1,000 mph" world speed record in 1955 had been relayed by Defense Secretary Charles E. Wilson.

Record breaking performance of the F11F-1F has been demonstrated during flight tests at USAF Flight Test Center, Edwards Air Force Base, where the latest version of the Tiger has been flying since spring. It has been flown by the company, Navy and USAF pilots including Maj. Gen. Albert Boyd, deputy commander of the Air Research and Development Command, for weapons testing and for the USAF Flight Test Center.

Most of the maximum performance work on the F11F-1F has been done by Lt. Col. George Watkins, a test pilot from the Navy's Patuxent River, Md., test center assigned to Edwards for the Tiger project.

### Performance Features

Among the more unusual features of the J79 powered Tiger performance are:

- Sufficient fuel capacity to make an attempt on both speed and altitude records in a single flight.
- Sufficient maneuverability above 70,000 ft. to aim and launch guided missiles at targets either above or below the Tiger.

The Tiger is now in production for the Navy at Grumman's Patuxent River, N.Y., plant as an aerial version powered by the Wright J65 turbojet. This



LARGER air intake section was necessary to house J79 turbojet. Leading edge extensions improve supersonic speed stability.

version was superior in level flight and was the first fighter in the world to incorporate the NACA-Delta wing side for drag reduction in the supersonic speed range.

An experimental modification of the more powerful General Electric J79 turbojet was made in 1955 with initial flight tests conducted in the spring of 1956 at Edwards. Some structural modifications were required to fit the J79 into the Tiger airframe (AW Oct. 25, p. 25). These included larger engine inlet air ducts and a larger air intake section to house the turbojet.

The F11F-1F also has leading edge wing extensions for better stability and control at supersonic speeds and a single-piece clear windshield on the cockpit.

The F11F-1F is now operating with a Phase I version of the J79 turbojet rated at about 15,000 lb. thrust without afterburning. Grumman and the Navy anticipate substantial performance increases for the Tiger using a later and more powerful version of the J79.

Before the Tiger must clear to make an official speed and altitude record run to the Department of Defense. Although both USAF and Navy test records have been willing to allow their records to make official record runs, Defense Secretary Charles E. Wilson

has personally vetoed several requests to do so from the services. Secretary Wilson has objects to a world record attempt on this project of alleged military aircraft applications. But technical experts in both services agree that there is no real reason involved in either a climb to maximum altitude or a 15 to 25 mile stretch straight and level speed run. He needs 30,000 and 40,000 ft. before the operational level required of modern fighters.

At a Pentagon press conference, Secretary Wilson recently told reporters he was not interested in world records and indicated he felt that there were no real reasons of consideration at all level. When Secretary Wilson authorized the Navy to make an attempt to set a new American speed record, the pilot, George R. "Doc" Wolford, was ordered to hold back his aircraft to as much as margin over 1,000 mph, as possible.

There also has been no official policy established at the Defense Department level to alternate the American speed record between the Air Force and Navy, regardless of which service has the aircraft technically capable of holding the record. There has been widespread consultation with the Defense Department itself record policy in both the military services and

the aircraft industry over since the Portuguese claims have permitted the record to go to England and stay there.

### \$24 Billion Balance

Washington—As Force and Navy, but an unexpected balance of \$24 billion on hand for payments on aircraft and related government contracts as of Oct. 1. The program with \$24.5 billion for the same date a year ago.

The unobligated balance, available for new contracting, totaled \$12.3 billion, compared with \$14.7 billion on Oct. 1 a year ago.

The unobligated \$24 billion for extra line procurement was divided: USAF, \$12.3 billion; Navy, \$6.5 billion. The \$12.3 billion in unobligated funds was divided: USAF, \$9.4 billion; Navy, \$2.9 billion.

USAF aircraft procurement obligations totaled 57 billion set during the first quarter (July through September) of Fiscal 1957. During the same Fiscal 1956 period, unobligated recorded new contracting for \$10 billion. New aircraft procurement obligations of \$10 billion for the last Fiscal 1957 quarter, compared with \$25 billion for the same period a year ago.

### New Simulated Altitude Record

Wright-Patterson Air Base—New speed record set by the F11F-1F was a private chamber at the Research and Development Command's Wright Air Development Center. The aircraft, designated the MC-4, was used in extreme high-altitude flights of the Bell X-2 rocket research plane, including Capt. Ben G. Kucharik Jr.'s record flight to 126,000 ft. (AW Sept. 24, p. 15). It also was used by two Navy officers who recently reached 75,000 ft. in a balloon.

New simulated record was set by Maj. Arnold L. Beck, Jr. of WADC's Aero Medical Laboratory. The "wet-bell" which will replace the T-1 sub-sonic research aircraft, has set up with no help (the T-1 required a helper) a more comfortable, gas-free protection and allows more reliable data than the T-1, according to AMEDC. It includes an expanded pressure helmet and pressure glass.

The MC-4 is for use in flight tests and in air activity and the MC-3 version is for use by bomber crews. The David Clark Co., of Worcester, Mass., will produce the MC-3 and Roger Brothers Co., of New Haven, Conn., will make the MC-4.

Highest simulated altitude reached with the T-1 was 100,000 ft. Maj. Beck reached 125,000 ft. in the MC-4 a few days before setting the new record.



## British Leader Hits Weapon System Plan

Washington—Sir Arnold Hall, technical director of the Hawker Siddeley group, criticized the weapon system design concept and endorsed a strong defense of Britain's aircraft industry last week in his 1956 Wright Brothers Lecture here.

Acknowledging that the British aircraft industry is facing a new flood of criticism at home and abroad, Sir Arnold argued that his country's current weapons and aircraft are as good as, or better than, those of competitors. To support this he cited foreign sales and Great Britain's lead in jet transport designs.

Sir Arnold cited a long list of difficulties that have bedeviled the British industry since World War II and concluded that there is more for criticism. But, he said, his country's technological resources have been improved in the past five or six years with a large investment that should ensure development work within the next decade.

Sir Arnold contended that the weapon system concept has slowed technological development and that the concept can force project planning to "go astray."

He argued that the emphasis placed upon having the result, engine, radio, instrument and other components developed in phase adds difficulties to the program by adding to the burden of technical work. He added:

"The greatest difficulties now become almost overwhelming. The designer of the wing wants to know the



## Scorpion Extends Landing Legs

Scorpion on approach to landing strip at Air Force Missile Test Center, Cocoa, Fla. Jet is still gas extended for landing. Gear is braked shock absorbers with metal shoes at end of each leg which slide on the runway during landing. As landing gear is braked to roll to one side or the other and a small wheel under the wingtip takes the secondary impact. Scorpion approach is directed by command from the Northrop F-89 Scorpion and other aircraft approach is limited by ground control. Scorpion was developed by Northrop Aircraft, Inc.

## Wright Memorial Award

Washington—Dr. Edward F. Weiser, current president of the International Civil Aviation Organization, was awarded the Wright Brothers Memorial Trophy for 1956 at the annual Wright Memorial Dinner last week in New Orleans. He was cited for "public service of enduring value to aviation in the United States."

A second major prize, the Frank G. Barnes Trophy, was given to Roy G. Benson, President of Southern and College Air Lines, Inc. He was awarded "for contributing the most to the development of air travel in the field of education and training."

The prizes were presented by Vice President Richard M. Nixon. Benson was cited for his leadership in 1956 in negotiating with representatives of the Civilian Transport to Western Air Lines, President of Boeing Aircraft Corp., and KLM, Chief of Staff Nathan F. Denning (AWR Dec. 17, p. 18).

speeds and loads of the weapons he must attack, but these are not yet fully designed; later, the weapons must be changed due to development needs, but then come changes in the wings when the gun are completed and aerial maneuvered to them.

"This situation is multiplied many times over in a comprehensive system. If a new project is to come through reasonably quickly, it should be in a state of maturity that the various elements that make it up are not all at the same stage in their evolution. In particular, are not all at the start of their evolution."

"By way of example, consider a fighter and suppose that the airplane represents a radical advance. I think the best progress, in time and in quality, will come from starting the new airplane around engines, radio and armament—or at my rate, two of these—which have reached or are approaching Mark I standard, and which are now proceeding in their evolution in development."

Sir Arnold and all elements of the weapon system should not be at the most advanced technical stage at the same time.

"By the staggering of the evolutionary stages of the elements in the system, I believe that a great deal of time can be saved," he said.

## Molybdenum Idea Offers 2,500F Hope

Turbine inlet temperatures as high as 2,400-2,500F may result from use of superalloy molybdenum turbine casing in non-cooling gas turbine engines, according to a Navy spokesman.

Through turbine inlet temperatures would provide the breakthrough for engines which could exceed 20,000 mph. Mach 2.7 or better for three hours at a time.

(Such a craft could enter New York to Paris in a couple of hours.)

Several companies have expressed interest in the necessary "non-cooling"

gas turbine cycles, a Chance Mally design Co. source said. The two leading approaches are constant closed-cycle and fuel-rich open-cycle.

Navy's Bureau of Ordnance has a contract with Experimental, Inc., Radonville, Va., which, although not specifically for aircraft powerplants is expected to "have some striking results pertinent to aircraft."

Helium or argon inert gas might be used in a closed loop cycle with the fuel energy added by a first exchanger at a conventional open cycle might be used which is so fuel rich that the unprotected molybdenum won't be oxidized away. This allows molybdenum's superior strength at high temperatures to be utilized directly. Most of the present reason of protecting molybdenum are not only expensive and of doubtful reliability, but are not expected to raise the cycle temperatures much over 2,000F.

Problems of this direct use of molybdenum are formidable but it is possible that exposures of future aircraft engines



now demand their solution. The weight and bulk of the closed cycle heat exchanger is a disadvantage but for certain nuclear powerplants which would not limit exchanger weight, the higher turbine inlet temperatures may help compensate for the weight and bulk of both the heat exchanger and the shield air.

The idea of fuel-rich combustion for open-cycle turbines, which at present could their status as heat cooling, also sounds impossible for the future, but the additional fuel could be injected just before the turbine so that it only had time to burn and would not start to burn until it reached the afterburner downstream.

## Jet Training Program Announced by CAB

Washington—Civil Aeronautics Administration last week announced a jet training program for key safety in aviation and flight test development that

will include various phases of flight training with a Lockheed T-33 jet trainer and two F-86C Shooting Stars.

The training program will be conducted at the CAA Aeronautical Center, Oldham County, where a Link jet trainer already has been recently installed.

During 1957, approximately 30 CAA officials will receive 30 hours each in the jet aircraft.

The three planes are on loan from the Air Force.

CAB also has borrowed two Martin B-57 Canberra-type bombers from the Air Force for use in the high-altitude checking of the human adaptation and communication facilities (AWR July 16, p. 40).

All present the program plans include advanced training in these two aircraft if they can be spared from the current program.

CAB members who will maintain the jet planes are scheduled to begin training Feb. 1 at Sheppard Air Force Base, Texas.













**STRATOFORTRESS** YC-134, taking off, shows tandem main wheel rotation, which has new struts and support system. Aircraft transport, rolled out at Houston, N. J., last week, also has its revised boundary layer control system combining blowing and suction techniques.

## YC-134 Marks Change in Flow System

By Russell Hovkin

TUCKER, N. J.—Stratofortress Aircraft Corp.'s YC-134, rolled out at the Meigs County Airport here last week, displayed an unusual boundary layer control system that combines suction at the outboard flaps with blowing over outboard flaps and ailerons.

A significant boundary development of the C-123, the YC-134, has had two small fans added outboard on each horizontal stabilizer. Instead of the two wheel main landing gear and dual nose wheel of the C-123, the YC-134 has a single nose wheel the same size as the main landing wheels, which are arranged in tandem pairs on each side of the fuselage. A center line suction system leads to the main gear in various attitudes.

Most of its new nose wheel because of replacement of the 2,700 hp Pratt & Whitney R2800 engines of the C-123 with Wright R3550 turbo-compound engines developing 3,400 hp. Stratofortress found the night nearly less with the

two small fans that with an addition to the already large main fan.

Two Continental-built Aspen 2 turbofans developing 400 cph each draw air in through louvers in the trailing edge of the wing when the outboard flaps are down.

This localized flow system and makes use of the propeller slipstream for an air supply.

### New System

As it flows out through a similar system where the outboard flaps are down, and over the ailerons, which are dropped to become spoilers.

Fuel degree drop is possible with the system, compared with the maximum 60 deg. available in the flow. The system, in effect, provides the suction over the entire span.

Stratofortress said the system doubles the lift coefficient of the wing. It also cuts down the aircraft's weight, operating from high altitude fields, or making possible a 40% reduction in takeoff run or 30% in landing

run. Normal empty weight takeoff run is 420 ft.

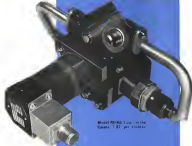
Use of the ducted flow system, which are independent and cannot involved in accidents, means there is little suspension problem except to provide expansion points in the duct required because of air compressions and a wing in a tight.

However, in the YC-134A, the next phase in the development, Stratofortress will replace this system with an all suction type drawing power from a Westinghouse J10 turbojet engine. This will produce supercruise and a tight configuration, and the exhaust will have to be discharged through the tail above the cargo door.

### Tip Flaps

Tip flaps, not carried by the YC-134, will be mounted on the A model, which will have the full-sized tip wing loadings using the Panhard air system.

The YC-134 was flown at the mil-



Model 10100-1 used in the C-130 for 1000 gph.

## MECHANICAL FUEL PROPORTIONERS PRODUCED BY STRATOS



Stratos Fuel Flow Proportioners\* offer aircraft fuel system designers a simple, mechanical method of fuel flow proportioning. Essentially multi-stationed positive displacement metering devices, the Stratos Fuel Proportioners can be produced in any desired ratios. The units can be actuated by the fuel flow, or driven—using electric or hydraulic motor or air or turbine.

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Accurate proportioning of flow from two or more tanks maintains longitudinal and inherent stability without pilot attention.

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**4 INCREASED OPERATIONAL RELIABILITY:** Acts as booster pump in event of fuel tank booster pump failure.

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\*Developed by Stratos in many aircraft operational experiments and demonstrated under test in the C-130 in tests flown by the Navy, USAF.







[illegible]

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# New Standards to Meet Jet Needs Demanded by Airport Operators

By L. I. Day

Washington—The Airport Operators Council has called for a high-level joint research and development group to establish airport standards and requirements for jet transport operations.

In a letter and oral half-hour presentation to President Eisenhower's Aviation Facilities Planning Group, headed by Edward Cahn, airport operators complained they were "frustrating" with design criteria developed by the Civil Aeronautics Administration—before 1950, which fails to reflect airport needs for jets.

The council charged that no airport research program exists either within the government or outside government sponsorship, although active research is conducted in almost every other aviation field.

## What Council Wants

Specifically, the council asked for:

- Research program that will determine parallel runway requirements, high speed taxi-out configurations, proper lighting and marking facilities, noise up-grades, jet-park ways and jetway area configurations and fuel storage and fueling procedures. Attempts to obtain such information from the CAA in recent years have been unsuccessful, the council said.

- Economic and technical forecasts to serve as a guide for long-range airport planning. Such planning probably will extend beyond financing projects based on 10-year needs.
- Nationwide master airport plan with government cooperation in selecting airport sites and supervising joint civil and military use of airports.

## Procedure Standardization

In asking for a coordinated research and development group, the council recognized that manufacturers will be required to provide information on new aircraft development before optimum research can be planned. The council also urged standardization of airline procedures and techniques to permit long-range planning of service and terminal facilities.

Comments from manufacturers and airlines on Civil Aeronautics Board Board Release 16-20 covering proposed regulations for turbine aircraft—which are due Jan. 11—were thought to light some existing information on future airport requirements. Airlines now are applying technical and economic data on jet aircraft, provided by the Air-

craft Industries Association, to airline routes and proposed schedules for presentation to the CAA.

However, airport operators fear jet operating restrictions proposed by the draft rules may curtail the runway of the present length of the aircraft and to reduce full payload benefits under existing regulations. For example, the proposed rules could reduce payload 10 tons on the Lockheed Electra and 25 to 30 tons on the Boeing 707 or Douglas DC-8 under hot weather conditions, according to the council.

Furthermore, the council is concerned that the CAA move will curtail the special conditions for jet transport loaded out by CAA with airlines and manufacturers. There are developed to insure growth in air transport and the absence of "single design factors" under authority granted to CAA by Civil Air Regulation 43.11. All information on runway requirements for jet transports provided by manufacturers in its is based on the CAA's specific conditions project, the council charged.

## Forecasts "Piecemeal"

Technical and economic forecasts are too "piecemeal" to be of any help to airport operators, the council said. It asked for a master plan developed by "an independent objective group" to draw abstracted program and design data from the various forecasts to conform with the number aircraft of all types expected in the future.

The council said available aircraft and forecasts on route to special groups in "self-interest" and "self-interest" could cause them to lack a translation and misvalue of the information can be drawn, it added.

Better forecasts on scheduling and

peak loads in order to arrive at maximum airport capacity also are needed, according to the council.

It would like to know how much central administrative agency what some acceptance site we are supposed to be showing us of our airports," the council said.

The council stressed design and management of building aircraft and airports or no airport for the support in cities required to keep them operating.

It said both military and civil airports have reported growth and an assumption to become adjusted to each new aircraft development, and it wanted "the first step" in providing when aircraft development must be integrated with support services development.

## Airport Location

Airport agencies are seeking new grade as the location of airports by airports and areas, based on anticipated needs of the future. The council said, however, the council said. It called for cooperation by private, public, commercial and military agencies in planning airports on high density areas and airports in low density areas. The council said its responsibility is to set standards for maximum separation distance between airports, location of holding and approach patterns and helicopter operations.

The council tackled the question of the relationship of federal and local responsibilities of airport operations and related its study that traffic control from long-term planning should be considered in the future.

Financial responsibility of construction and maintenance of airports should be changed to the federal government since such work is a part of the "national defense" program, the council said. However, the council said, however, the joint responsibility of the federal government and the local airport operator, the council said.

# Southwest Pushes Name Change

Washington—Southwest Airlines is moving ahead with plans to change its name to Pacific Air Lines in spite of considerable push up by the Civil Aeronautics Board.

Southwest has asked the Board to refuse its permanent operating certificate in the United States for Jan. 1, 1961. The CAA denied the airline permission to use the Pacific name in an interim program it planned to allow the public on the switch from Southwest Airlines to Pacific Air Lines.

Supporting the petition for a permanent name change, Southwest argued that the new name would better describe the West Coast area it serves and that

it would be easier to pronounce. The airline also holds that the new name would be more usable to the traveling public and would aid in traffic development and reduction of subsidy.

The decision to make the switch was made in June when Southwest's stockholders voted to change the name. The name was to become effective on Jan. 1, and an interim transition program was planned in which both names would be used.

Use of the name Pacific Air Lines would support the airline's planned new airlines. CAA approval, in Southwest's view, is a prerequisite in Jan. 1 when the Pacific name until Jan. 1 when the

switch would be finally complete.

In November, the CAA denied the requested authority to the airline that the new name would mean substantial public confusion. Some airlines, however, have named which include the word Pacific.

The Board received various objections in Southwest's plan from Pacific Northwest Airlines, South Pacific Air Lines, Pacific Air Lines and Pacific Southwest Airlines.

## No Confusion

Southwest denies there would be an substantial public confusion involved in the change and said that the Board denied the airline's name permanently, because the CAA took too much time to act on the July application, the airline program is a dead letter.

The local airline points out that although confusion and plans must be made in advance, and that its program for 1957 has already been filed several times with the Federal Aviation Commission.

Also, because of the confusion involved, the airline has not been repeating its name since they have gone through several in recent weeks, and several airlines are operating without any business marking at all.

## New Name Needed

Southwest said it has had the same change in mind for several years. The airline believes the changing public associates the Southwest name with the multi-stop short-haul service provided when the airline first started flying. The airline said that a new name would give Southwest a better image, a more high way to lead into the air.

The airline said the Board has accepted the airline's application to the change can be effected by Jan. 1. There is no objection, Southwest said, to the airline's name, the change without a public hearing if it wants to.

# New York Airways Hires Negro Copilot

New York—New York Airways has hired Don H. Young, a Negro, as a pilot for its scheduled long-haul express service. Young graduated with an air transport certificate in 1954.

According to the Urban League of Greater New York, Young is the first Negro to be employed in a flight crew by a United States scheduled passenger airline.

Young had applied to become a pilot with the helicopter service since he was 16, but his application was rejected on the ground of his race. Young was a CAA pilot rating multi-engine multi-engine on 5-15 New York Airways, but had no experience in a pilot. He will train to become a first pilot.

# AIRLINE OBSERVER

► Decision to adopt greatly feature of the No-Show Plan probably will be approved at the Jan. 15 meeting of the Air Traffic Commission. Most airlines feel that some dummy plan will be given a trial if Civil Aeronautics Board presents its views on the no-show problem. It is to be decided. However, many airlines officials doubt the proposed ruling will increase revenues. They say it, partially will merely isolate ground no-shows into conditions, and that the number of seats available for business of an airline will not be reduced enough to produce revenue gains. Some observers privately fear lower passenger will be seriously impacted because the volume of incoming telephone calls that already are dropping some airline overheads on other passengers a passenger from reaching his own without delay.

► Civil Aeronautics Administration has set Jan. 15 in the light duty in updating its traffic conditions entitled to a pay boost under the revised grade structure approved only this fall by the Civil Service Commission (AW Oct. 1, p. 41).

► Zeroed-out weight of the Fokker Friendship F-27 turboprop transport has been increased from 31,710 lb. to 32,210 lb. and maximum landing weight has been raised to 35,000 lb. to 34,800 lb. without changing observed 3,000 lb. landing runway length requirements of the aircraft.

► Canadian Air Lines Pilot Association has called for the establishment of a standby emergency fund to cover the cost of the airline's flight attendants by U.S. airlines under new laws. Canadian pilots agree with a fleet would have experienced DOW line flight operations and could have been used to move United Nations troops into the Soviet area.

► Eastern Air Lines is launching an accelerated promotional campaign throughout the north-south, Colonial Domain territory in a move to expand its Florida vacation market.

► No transportation has a better fate than it is "stronger, better educated and more profitable" than most industries, according to a survey recently conducted by the Labor Department's Bureau of Employment Security. From the survey, which covered 377 of the 1,344,000 persons employed by the industry, the bureau concluded that rapid qualifications established for airline jobs create recruitment problems. Most critical shortages are in mechanics and pilot job categories, but the survey showed widespread shortages of ticket agents, hostesses, cargo handlers, cleaners and sheet metal workers.

► United Airlines is pre-loading cargo containers on its DC-8s but will remove two of the aircraft's cargo ports for manually loaded cargo. The decision is the result of its conflicts with United with the DCA week-long cargo, mail and baggage of varying weights and volumes. United stated that the pre-loading containers can be loaded or unloaded in seven minutes with the airline's present ramp equipment.

► Airlines have been unsuccessful in developing a universal interstate security message form that is acceptable to all types of interstate operations. Airlines have submitted the form to the Federal Bureau of Investigation, Birmingham Road and International Bureau Machines has been in close touch with the airlines in a move to develop more completely in response to present one delay in progress toward full international of international procedures.

► First jet-fighting venture proved successful as recent tests conducted by American, TWA and United Airlines in cooperation with the City of Chicago. Former carbon dioxide and high-type extrusion process of oxygen, oxygen in cooperation for use to meet aircraft fuel with high-oxygen and work tested in oil and gasoline at Midway, August. New fuel-type such potential facilities to meet future demand.

► Actual travel on North Atlantic routes increased about 20% this year. Traffic experts are crediting the new offshore terminals and increased fares for a major improvement in the North Atlantic traffic picture.











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First Pilot Alexander Bystolski sits at the back of Soviet Tu-104 jet transport used on Trans-Siberian route. Foundation staff is at left. Pilot wears throat microphone; low oxygen mask, apparently for emergency use, clipped to coat.

Engine work stands used by American on DC-7, DC-6 and Constellation will be suitable for the Lockheed Electra.

The Boeing 707, however, will require redesigned stands because of the shape of the wingtips and their height from the ground.

American does not expect to install permanent desks for wage and housing maintenance of the 767 since retrofit for field maintenance agencies at this site not anticipated. New tool stands will be acquired since present work stands are only 30 in. high. The 767 tool is 40 in. in height.

But American loans towards portable scaffolding, platforms and stands are probably not until final deal. Indeed, Trans Canada pointed out that stands are not needed by Vancouver region immediately since the rigging are being too rough to permit work from the level.

TWA hopes to develop a universal stand that is adaptable to all pit or craft. United plans to explore the possible types of work stand.

Now, will dictate the location of most engine run-up sites. Americans and West Germans may be essential in some areas and suggested the possibility of ground noise suppression for all run-up operations.

Pan American suggested the use of

Let's face it. Engineers are people, and people have a habit of following old means once in a while, either rightly or wrongly. Kenan Aircraft considers it quite an achievement that the members of the Engineering staff have worked hard and long and well on many classified projects with very, very few examples.

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## Forma 3

- ☐ Age-Related
- ☐ Design (including B. Strand)
- ☐ Research
- ☐ Technical Design & Layout
- ☐ Interviews
- ☐ Layout
- ☐ Media-related Design
- ☐ Packaging Design & Research
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- ☐ Systems Development
- ☐ Visual Design
- ☐ Text & Readability
- ☐ The Interview
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USS SPECIAL AIRCRAFT STEELS

UNITED STATES STEEL





Concrete ramp pads (504) by 175-ft. Three Canada has found that blast loads 12-ft high provide reasonable stress and blast response for the Vancouver.

TWA plans to build 100-ft blast fence and add its construction department is now experimenting on a concrete wall for noise suppression close to the runway. The wall will be concrete with rubber-sheathed type expansion joints.

## CAB Discusses West Coast Tour

Washington—Civil Aeronautics Board members who toured West Coast jet transport manufacturing plants earlier this month (AW Dec 10, p 31) have outlined the jet transport new order development by major U.S. aircraft companies.

The four CAB members who visited Boeing Airplane Co., Douglas Aircraft Co., Lockheed Aircraft Corp. and Convair Division of General Dynamics were all enthusiastic over their flight on the Boeing 707 and their discussions with the engineers and economists working on the four companies' jet projects.

### Future Vists

The Board plans to visit Fairchild Engine and Airplane Corp. for discussions on the F100 turbojet and the B-165 jet executive transport. James R. Dwyer, CAB chairman, said the Board plans to fly on all the new turbine turbo jet types.

The CAB chairman said he is required the need for early action on new turbine turbojet certification rules and revealed that the Board is along

United states to pay its jet air traffic with concrete, making the joint with less reliable compared to conventional effects of fuel spillage. The airline will use noise suppression but plans to locate the jet jet area at a suitable location of its plot where no blast fence will be required.

Engine noise screens may be used by the airlines to prevent engine ingestion of foreign matter.

for a substantial increase in air traffic for fiscal 1958 he heard, the heavy work had that in developing with the advent of jet transports. Most of the extra money will go to increase the staff of the Bureau of Safety Regulation.

Observing that development of jet transport and revolutionary problems to the CAB, Dwyer said present certification rules "will obviously require considerable revision."

He acknowledged that any delay in certification, either through revision of the rules or otherwise, would be a factor of incalculable cost to the manufacturers, the airlines and the public. He said he is confident that the CAB will have its safety rules for "helicopter protection of the public" ready in time for certification.

### Economy of Electra

Dwyer also reported an observation he made in Los Angeles that the Lockheed Electra holds the greatest promise for economy on shorter routes in the jet era.

He told Aviation Week that his

observation on the Electra was based upon a comparison of the economic data presented to the Board by each of the four manufacturers visited. With this information in a hand, Dwyer said he is impressed with the relative economic advantages of the Electra on the shorter routes.

CAB Vice Chairman Joseph P. Adams thinks a major feature of the new jets will be the lighter, more spacious cabins and the freedom from noise, vibration and turbulence. He said a passenger feels as if he is wrapped in a cocoon of comfort.

Adams feels that the jet transport will bring a new era of passenger acceptance of air transportation and that higher speeds mean more passenger appeal. He thinks the jets will operate comfortably from the city of attraction.

## Survey Shows Many Shy of Air Travel

Three-fourths of American adults have never traveled by air, and just 10% probably helped keep the majority of them on the ground, according to the Survey Research Center of the University of Michigan.

Seventeen percent of the respondents in the center's 1955 National Travel Market Survey who had ever traveled by air means listed general fear of flying as a drawback. Fear of air sickness specifically was the third-leading drawback listed by 5% of the adults surveyed.

In its findings of the survey, the center reported 35% of the respond-

ents had never taken a trip by air, 51% had never taken a long trip, 30% had never gone by rail, and 11% had never taken an automobile trip. Sixteen percent had flown at some time, but only 7% had flown within the past year.

Speed of flying was cited by 36% of those respondents who had ever taken a trip by air. Lack of comfort was an advantage of air travel, with 28% reporting themselves as "amazed" "low planes, full of light." Third-ranking advantage of air was its cost, with 25% listing air travel as cheap, cheaper or reasonable.

The survey was supported financially by the Port of New York Authority and the New York Central Railroad. Other airlines declined comment on the survey.

Two-thirds of all trips by adults in the United States are for pleasure or on vacations (the report distinguished "pleasure" trips from visits with friends or relatives).

Of the adult population, 60% take one or more trips a year, but 36% never get as far as 100 mi. from home.

Three out of four people from families with \$15,000 or higher incomes have taken an air trip at some time. Only one in ten in the below \$15,000 group has traveled by air. Proportion of those who flew during the past year is 1-2% in below \$15,000 group income,

\$15,000 to \$20,000 income, 6-12% in \$20,000 to \$25,000 income, 13-20% in \$25,000 to \$30,000 income, 21-25% in \$30,000 to \$35,000 income, 26-30% in \$35,000 to \$40,000 income, 31-35% in \$40,000 to \$45,000 income, 36-40% in \$45,000 to \$50,000 income, 41-45% in \$50,000 to \$55,000 income, 46-50% in \$55,000 to \$60,000 income, 51-55% in \$60,000 to \$65,000 income, 56-60% in \$65,000 to \$70,000 income, 61-65% in \$70,000 to \$75,000 income, 66-70% in \$75,000 to \$80,000 income, 71-75% in \$80,000 to \$85,000 income, 76-80% in \$85,000 to \$90,000 income, 81-85% in \$90,000 to \$95,000 income, 86-90% in \$95,000 to \$100,000 income, 91-95% in \$100,000 to \$105,000 income, 96-100% in \$105,000 to \$110,000 income, 101-105% in \$110,000 to \$115,000 income, 106-110% in \$115,000 to \$120,000 income, 111-115% in \$120,000 to \$125,000 income, 116-120% in \$125,000 to \$130,000 income, 121-125% in \$130,000 to \$135,000 income, 126-130% in \$135,000 to \$140,000 income, 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711-715% in \$720,000 to \$725,000 income, 716-720% in \$725,000 to \$730,000 income, 721-725% in \$730,000 to \$735,000 income, 726-730% in \$735,000 to \$740,000 income, 731-735% in \$740,000 to \$745,000 income, 736-740% in \$745,000 to \$750,000 income, 741-745% in \$750,000 to \$755,000 income, 746-750% in \$755,000 to \$760,000 income, 751-755% in \$760,000 to \$765,000 income, 756-760% in \$765,000 to \$770,000 income, 761-765% in \$770,000 to \$775,000 income, 766-770% in \$775,000 to \$780,000 income, 771-775% in \$780,000 to \$785,000 income, 776-780% in \$785,000 to \$790,000 income, 781-785% in \$790,000 to \$795,000 income, 786-790% in \$795,000 to \$800,000 income, 791-795% in \$800,000 to \$805,000 income, 796-800% in \$805,000 to \$810,000 income, 801-805% in \$810,000 to \$815,000 income, 806-810% in \$815,000 to \$820,000 income, 811-815% in \$820,000 to \$825,000 income, 816-820% in \$825,000 to \$830,000 income, 821-825% in \$830,000 to \$835,000 income, 826-830% in 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**NEW CALIDYNE**  
**model 174 SHAKER**  
 1500 lbs. force output

**a bench shaker for 3 different Vibration Test Systems**

Model	Frequency	Force	Weight	Dimensions	Price
Model 174	10-1000 Hz	1500 lbs.	150 lbs.	18" x 18" x 18"	\$1,500
Model 174A	10-1000 Hz	1500 lbs.	150 lbs.	18" x 18" x 18"	\$1,800
Model 174B	10-1000 Hz	1500 lbs.	150 lbs.	18" x 18" x 18"	\$2,000
Model 174C	10-1000 Hz	1500 lbs.	150 lbs.	18" x 18" x 18"	\$2,200
Model 174D	10-1000 Hz	1500 lbs.	150 lbs.	18" x 18" x 18"	\$2,400
Model 174E	10-1000 Hz	1500 lbs.	150 lbs.	18" x 18" x 18"	\$2,600
Model 174F	10-1000 Hz	1500 lbs.	150 lbs.	18" x 18" x 18"	\$2,800
Model 174G	10-1000 Hz	1500 lbs.	150 lbs.	18" x 18" x 18"	\$3,000

Also available for Random Vibration Testing

Calidyne's Model 174 Shaker features high frequency operation and high output capability. It is designed for use in a wide range of applications. The shaker is available in three models: Model 174, Model 174A, and Model 174B. Each model has a different frequency range and output capability.

The shaker is available in three models: Model 174, Model 174A, and Model 174B. Each model has a different frequency range and output capability. The shaker is available in three models: Model 174, Model 174A, and Model 174B. Each model has a different frequency range and output capability.

1. Model 174 Shaker features high frequency operation and high output capability.
2. Model 174A Shaker features high frequency operation and high output capability.
3. Model 174B Shaker features high frequency operation and high output capability.
4. Model 174C Shaker features high frequency operation and high output capability.
5. Model 174D Shaker features high frequency operation and high output capability.
6. Model 174E Shaker features high frequency operation and high output capability.
7. Model 174F Shaker features high frequency operation and high output capability.
8. Model 174G Shaker features high frequency operation and high output capability.

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New Bentley-Bonded Lacing and Winding Tape combines two superior materials—DuPont Teflon and glass fibers. Fibers are Teflon-coated before lacing to maintain rough texture and assure tight knots—and to eliminate abrasive action of the glass. Bentley Tapes will cut through and seal through hardened wires. They are pliable from -100°F to 300°F. They are noncombustible and inert to most known chemicals and oils... completely weather and fungus proof.

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per light base charge for shorter service.  
 From the Ferry Building to San Francisco International Airport—in 11-minute trips—will cost \$7.50 per passenger.

Julius Hughes, Bell's chief pilot, said the test service will not be a money-making proposition because return trips often will be made with no passengers on board.

Many reasons for offering the service, he explained, is to promote interest in helicopter travel. Bell hopes to assess enough demand in the area for scheduled helicopter service to make its Civil Aeronautics Board application to the flying stage.

Bell applied five years ago for permission to operate scheduled helicopter service within a 250-mile radius of San Francisco, but no hearing has been held yet.

Bell would need a government subsidy to operate the proposed helicopter service.

The same test service is fast sub operation on the Bay area.

It will be based at San Francisco International Airport, where Bell is headquartered.

## Lease-Purchase Plan Offered to Airlines

Aircraft rental with options to purchase will be offered to airlines on an expanded basis by Standard Factors Corporation, a national commercial finance company.

Standard Factors, which has provided some purchase/leaseback financing of planes on an experimental basis since early 1958, includes a trade-in arrangement through which airlines may replace older equipment.

Under the trade-in plan, Standard Factors will apply the value of the older plane to the cost of new equipment provided under the lease-purchase agreement.

The older equipment will then be sold to secondary airlines on a pay-go-go basis.

The firm reports a total of 14 new and used commercial jet transports it leased to date through lease-purchase arrangements with airlines. Two lease formulas have been used in setting option prices.

Under one formula, a fixed percentage of the rentals is applied to the purchase or option price, with the balance of rental payments retained by Standard Factors.

The other plan, designed for longer term leases, calls for higher purchase prices during the early years of the lease, with option prices increasing as lease age paid off and carrying charges decreased.

## Helicopters Lift Stranded Lightplanes

FL. Baiter, Ala.—A new helicopter lift technique to speed relocation of stranded light aircraft from remote areas has been perfected at the U. S. Army Aviation Center here. The system has applications in training and combat.

Designed by engineers of the Continental Army Command's Base 6 and built by Helms Aircraft Corp., of Birmingham, Ala., the system is a tandem seat frame that is quickly hoisted to the roof of an L-19 cockpit, providing a lift point that eases proper balance.

Thus far, the work has been done with the exterior sling on a Sikorski H-34 helicopter. However, the device can be used with any helicopter of sufficient capacity, such as the Sikorski H-19A, Vertol H-21C or a flying crane.

### Benefits of Technique

Col Robert A. Williams, Base 6 president, points out that a forced landing is an inescapable fact of a forced landing. A lightplane pilot can create a major problem if the plane cannot be flown back to base. In one case, it required two days of work to salvage such an aircraft, and about \$2,000 worth of damage was done getting the plane free of the hazard.

In the short time that the Aviation Center has been testing the new technique it has been put to good use.

In one case, an L-19 made a forced landing on a mud spit on the Gulf of Mexico. A hoist could have been attempted, but an engine change was necessary. The H-34 brought the aircraft home for repairs.  
 In another instance, a Bell H-13 helicopter on route to Ft. Bowler from the ferry at Delton was forced down by an engine failure about 15 mi west of New Orleans. It was impossible to change the engine at the scene. Disassembly of the aircraft was prevented by picking it up with an H-34 and towing it 20 mi to the nearest airport. The engine was changed, and the H-13 was flown to its trip.

### Economy

Col Williams emphasizes the economy inherent in using the helicopter to remove disabled aircraft.

It saves repair money from long and tough jobs, prevents further damage to the plane and speeds its return to operational service.

In combat, the same savings can be realized at a time when they are most critical.

Salvage teams always are at a disadvantage in the remoteness of a field and sometimes provide a vulnerable target for the enemy.



TUGGAGE and hoist from Sikorski H-34 is attached to L-19 observation plane.



HELICOPTER lifts L-19 close to ground (top) and flies off (below), giving altitude.





## Three Autopilots Will Guide Vanguard

By Philip J. Kline

New York—Pratt Vanguard (anti-satellite) vehicle will employ eight separate control systems to provide pitch, yaw and roll stabilization during different phases of its flight. "The guidance control systems were described here as a result of a meeting of the American Institute of Electrical Engineers by Peter A. Foreman, Project Vanguard control group engineer for Glenn L. Martin Co.

To save weight, the Vanguard vehicle has no controllable fins. Instead guidance is achieved by deflating the thrust area of the first and second stage rocket nozzles during powered flight.

While this approach permits mass payload, it complicates the guidance-control system designer's task, Foreman said.

### System Division

Three of the control systems will be used to provide pitch, yaw and roll stabilization of the first stage. These three systems will take over after first-stage separation to control the second and third stages.

The remaining two control systems will come into use during the coasting phase after second stage burn-out but before separation from the third stage, Foreman reported.

The eight control systems, being developed by Vickers (division of Sperry

Rand Corp.) will share pitch, yaw and roll gyro displacement signals from a gyro stabilized platform developed by Westinghouse (New York). (AV Sept. 24, p. 27)

### Linear and Non-Linear

Martin will use both linear and non-linear ("bang-bang") type control systems in Vanguard. Pitch and yaw stabilization, which must be held to close tolerances (approximately one-half degree), will be accomplished by rate error rate or magnetic amplifiers, power hydraulic actuators which actuate the rocket motor and its thrust line.

This applies to both the first and second stage (before burn-out) control systems.

Roll stabilization of the first and second stages will use non-linear on-off control systems to operate a pair of nozzles whose thrust is provided by turbo pump exhaust. The bang-bang "bang-bang" type control can be used because the roll axis need be stabilized only to within about three degrees, Foreman said.

Also, because the thrust jet is essentially an all type device without proportional control, there is no need to provide the thrust complex and sophisticated linear control system, Foreman added.

After second stage burn-out, the rocket motor can no longer be used for

stabilization. During the coasting period (prior to dropping the second stage), two pairs of thrust jets are used one pair each to provide pitch and yaw control moments. These also are operated linear on-off type control systems.

The third stage, containing the satellite, has no stabilization control system. It relies upon gyroscope moments established when it is spun about its roll axis just prior to separation from the second stage.

This is the same type of stabilization that is attempted to a shell by tumble rolling.

### Tough Control Problems

The Vanguard vehicle stabilization is complicated by the fact that 90% of the gross weight (first) is unloaded during the flight, which is changing the center of gravity and moment of inertia. Foreman pointed out. Other control problems may become the vehicle's structural rigidity is added to a minimum to permit maximum useful payload.

This rigidity in structural bending and vibration. If this structural response corresponds to the natural frequency of the control system, it can destroy the vehicle.

Structural resistance posed a serious problem on the Martin Viking rocket, and the 72-foot Vanguard vehicle is even more susceptible because of its greater fuselage cross length (divided by diameter).

Another problem arose because of the high intensity soundfield feedback of noise from the rocket engine. To less this audio feedback is suitably filtered, it can produce resonance in the structure and the control system, Foreman said.

Martin has selected a displacement rate type control system for the Vanguard linear (pitch, yaw) controls with rate being derived from an R/C network.

### Two Types of Amplifiers

Martin is having both vacuum tube and magnetic core amplifiers developed to provide a backup in the event one proves unsuitable. Foreman said that the magnetic amplifiers run cooler, lighter, but the vacuum tube version is more flexible in its capabilities.

The M18 stabilized platform will use H100 (integrating) gyros. These double gyros are extremely rugged and accurate, both supporting requirements for



**MODIFIED** Viking rocket, stabilized along its platform (below), is first (above) in first coast in Vanguard satellite test program. Viking reached height of 125 mi., traveled 110 mi. over last Atlantic Ocean from firing site at Cape Canaveral, Fla. Platform was carried back before firing. Second coast in test program will begin next month. (AV Dec. 10, p. 23). Viking is built by Glenn L. Martin Co.



operation of the Vanguard vehicle. The H100 gyro also has a torque motor which enables it to be processed at any desired rate.

### Critical Phase

Then a matter of two ways. First it permits programming of the Vanguard vehicle's path into attitude to give it the desired flight path and orbit. Secondly, it permits the gyros to be aligned prior to launching a difficult and time-consuming operation for the required accuracy—after which the gyros can be corrected for apparent drift caused by the earth's rotation by introducing a signal which produces the gyro sufficiently to compensate for such rotational effect.

The most critical phase of the entire operation will come during the coasting phase after second stage burn-out, Foreman said.

At this time the vehicle must be stabilized with a pitch accuracy of better than one-half degree. This means that the gyro stabilized platform must be aligned to the horizontal with considerably greater accuracy.

Any gyro drift which has occurred during the first and second stage flight will appear as a stabilized platform error, which is the accumulated total (integral) of gyro drift from the time of launch.

## Boeing Takes Second Bomarc Site Option

Boeing Airplane Co. has taken an option on a second tract at the San Francisco Bay area as the possible bombing site for a production reactor production plant.

Both tracts, the second at the San Ramon valley near Palo Alto and the first, a Ford Motor Co. plant at Richmond, Calif., would be used in a program involving the USAF's superconducting reactor, Boeing's Nuclear option has been extended and the decision hinges on isotope mining and transportation for utilities and rail transportation.

Boeing's Boeing contract is for the complete design, construction,

## Testing Completed for Martin TM-61 Matador

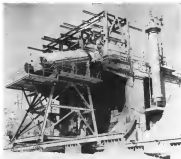
Final testing of Martin's TM-61 Matador missile is complete at the Air Force Missile Test Center, Patrick Air Force Base, Fla.

Matador that has become USAF's first tactical missile in operational status. Two units trained at Patrick, the 1st and 9th Tactical Missile Squadrons are the first to be equipped with the Matador.



**DYNAMIC** mock-up of five-stage Vanguard autopilot which uses hydraulic actuators to deflect rocket engine, enables Martin engineers to test system operation.





## Aerojet Sacramento Test Stands

An Aerojet ballistic missile program will result in substantially increased production at Sacramento, Calif. plant of Aerojet-General Corp. The company has production contracts for liquid rocket engines for space launchers, Titan II and Atlas and intercontinental range Thor missiles.

Sacramento operations—five plants on 20,000 acres—includes three portions. Coldest type test stand used in development test loops of thrust chamber and injector (dropl). Each firing position has a 500,000 lb thrust rating.

In front of the test stand can be seen large chamber used to simulate stratospheric conditions.

### Stands in Pairs

One of larger test stands of the four examples of structural parts at the facility is shown at right. Located along a 40 ft. deep runway, this stand is used for liquid engine firing. Test stand sizes range from 50 ft. by 55 ft. high to 67 ft. depth to 87 x 100 x 87 ft.

Four control buildings house instrumentation for operation of two of the test stands, and the stands and control buildings are connected by tunnels. In instrumentation, is equipped of equipment for: gulfing low frequency, medium frequency, high frequency data and timing equipment.

•Low frequency equipment has 104 channels available. Static and quasi-

static information is recorded on tape, converted and tabulated.

•Medium frequency equipment—192 channels of pressure, force, valve position can be recorded.

•High frequency equipment. Data is recorded in tape and available in recording oscillograph on 24 channels.

•Timing equipment on 96 channels are



recorded on oscillographs and recorded by product units.

Each test stand has three firing positions to high instrument each test, including system freedom according equipment. Time required for this transfer is about 45 min. on control units. Reduced data is available 30 min. after normal firing. Analog and digital digital computers are used and an IBM 704 and a being installed.

Cold flow test facilities of the Liquid rocket plant are used for compression. Pump test equipment includes electric drive equipment delivering 2,210 hp at 30,000 rpm.

Liquid oxygen is to be supplied by mobile plant in the test area, and a liquid gas plant is under construction by Air Products Co. via 135-ft. contract. Liquid plant currently size 700-800 gal of water a day and 2,257,780 lbs. per month.

### Construction Program

This construction is part of the test structural program underway. It includes additional test stands, which the company is building with its own funds and a \$15 million, 200,000 sq ft production plant which will be shared with under an Air Force contract.

Existing buildings include an air conditioning and engineering building, the liquid rocket plant, and a solid rocket plant which has produced 100,000-900,000 lb of propellant per month since production began in 1912 on a Navy contract.

Firing of 1,100 near engines is contemplated for the new production plant. At present the Sacramento plant employs about 3,500.

## Rocket Quality Fuel Made From Ammonia

Advanced hydraulic rocket fuel quality has been produced from ammonia on a laboratory scale as a gas phase chemical reaction carried out in a high frequency electrical discharge.

The process was developed and patented by Lord Manufacturing Co. Inc., Ft. Lauderdale, Fla. The process is used to produce high performance in a complete pilot plant. Work on the process dates back to 1944; the technique was patented two years ago.

Basically the reaction material—in this case, ammonia—flows through a radio frequency field of decreasing networks. Zones of controlled pressure, temperature and resistance time are formed and the final product is a purified, formed and stored from three zones.

The company says the process is particularly suited to chemical rocket reactions which are difficult or impossible to do under conventional techniques.



### Oak Ridge Tower Shielding Facility

Five 324 ft. steel towers are used to simulate shielding conditions of an reactor in flight at the Oak Ridge National Laboratory. Facility was constructed at a cost of \$2 million by Atomic Energy Commission's aircraft reactor program. Protective shielding for core and a test reactor with its own shielding can be suspended as shown in the photograph.

Future research on the process is aimed at the production of high energy fuels for missile propulsion, intercontinental for high temperature constant pressure and other high acceleration concepts.

Lord Manufacturing Co. has been known for its work with vibration control mounts and loaded rubber products. This chemical research work was done by the company's Control Research Staff as part of its work on related fields.

## Lithium Producers Establish Institute

Research activities for lithium and its compounds on an industry wide basis is the major reason behind the recent formation of the American Lithium Institute, Inc.

Three major lithium producers—

American Potash and Chemical Corp., Fawns Mineral Co. and Lithium Corp. of America—formed the Institute.

The Institute will act as a technical information agency and will maintain a library and literature service at its Princeton, N.J. office.

Lithium is one of the light metals and is the base for many high performance alloys (ASTM Spec. 12, p. 51). Other uses of lithium include light-weighted alloys, plastic electrolyte agents, and as a base for high-temperature materials, or as a base for high-temperature materials, or as a base for high-temperature materials.

The Institute plans to support research and development on the problems of lithium use in chemistry, ceramics, metallurgy and electronics. Projects will be assigned to colleges and research institutions and will be monitored by the Technical Policy Committee composed of representatives from the three companies supporting the Institute.

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# "Tan Glove" Adds Magnetic Dimension

By Russell Hoveler

Dedford, Mass.—Overall shape and orientation of the earth's dipole magnetic field as it would be observed at an altitude of 1,000 mi. is being calculated from the position of the geomagnetic equator recently traced by the Geophysical Research Directorate of USAF's Cambridge Research Center (AW Sept. 24, 1956, p. 18).

Results of the survey, Project Tan Glove, are expected to be useful in planning and evaluating satellite programs in the International Geophysical Year 1957-1958.

## Equator Tracing

Project Tan Glove accomplished the geomagnetic equator tracing by seeking out the line of lowest cosmic ray intensity caused by magnetic deflection of the rays toward the poles. Measurement was made by a neutron pile stacked around the earth in a specially equipped KC-97 borrowed from SMC following a cruise which aggregated 900 mi. in either side of the geographic equator.

A theoretical model of the field of altitude was established by Dr. John A. Seeger and Peter Meier of the University of Chicago Enrico Fermi Institute of Nuclear Studies. The Air Force study provided a check on the theory.

The absolute magnetic field pole indicated to the Air Force investigators is about 45 deg. of longitude west and about 1 deg. of latitude north of the theoretical pole. Both locations are close to the geographic pole from the surface position of the magnetic pole, which is near Thule. The difference be-



**NEUTRON PILE** in take apart and lead and profile blocks are attached to the KC-97. Leads of neutron counting gas tubes are visible in part of the pile in track.

tween surface position and altitude position is due to local distortions of the field.

## Indirect Measurement

Direct measurement of cosmic ray intensity is impossible because cosmic primaries or Alpha particles seldom penetrate the atmosphere to an altitude which can be reached by investigators. However, it is possible to measure the concentration of cosmic secondaries or Beta particles which are produced by the collision of the Alpha with the atmosphere.

The 1,100 lb. neutron pile used to measure the radiation was lifted to the Air Force by the T-100 Hercules, which has placed similar neutron piles in observation throughout the world. Readings from these fixed installations are being used as a check on study results to make sure that variations in the total neutron rate not correlated with geographic variation.

The pile consists of a shell of lead bricks from which neutron are freed by the impact of Beta particles, a 4 ft. shell, profile radiator and two pairs of boron gas filled ion tubes to trace the counting record.

A 600 in. cable wire runs the length of each tube.

To increase the sensitivity of the tubes, each is kept partially covered in paraffin below the count threshold by counteracting a drop of 2,000 c. across the count wire. To avoid spurious cosmic voltage control is accurate neutron counts only.

The counter is fired by complete saturation of the boron gas in two sections.

Before each leg of the trip, the pile was pre-flight checked by connecting radiation from a lead protected benchtop copper neutron source. The 50,000 cur. half life of the source assured a one-half section could be substituted.

Project scientist Ludwig Kite and instrumentation assistant, John F. Butler, passed the SAC crew of the KC-97 for the program, with which they controlled the conditions of the study and for holding strictly to the schedule of the flight in spite of difficulties.

Accuracy of measurements depended



**ELECTRONIC TEST** equipment added to flight record on C-97 on project. It was used to check net cosmic ray in the counter.

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upon cockpit seating and keeping a constant atmospheric zone above the pilot beneath the fuselage controls. But accuracy. Pressure altitude was chosen as a measure because it is an accurate function of atmospheric mass above the altimeter.

Pressure loading of altitude was vital because cockpit control varies exponentially with pressure altitude.

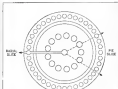
Kato said that a tolerance of 10 ft would have been acceptable but that

the SAC pilots had actually held the KC-97 within 10 ft of the probable mass test altitude of 11,000 ft throughout the lengthy test runs of the 90,000-mi. flight around the world.

Score parts and maintenance crew for the KC-97 were lost to the project when the C-119 carrying them was grounded by a brake cable in the flight. Crew members of the navigation gals can not keep the study on schedule in working long hours and sleeping outside

their various airplanes to get the work done.

Weight and maintenance problem was caused on the flight by the two big air conditioning packs for the gals which were designed for ground use. These required a special 60 cycle, 110 watt generator and power controls. They were needed to cool the gals and hold relative humidity below 75%. Higher humidity would have caused apron cracks.



STRESS LINE "Therein" is a section pressure vessel model (lower right) above other stress are placed under pressure (upper left and right). Drawing (center) indicates the stress lines of the solid and pre-shaped stress which were cut out of the plastic model body.

## Westinghouse Adapts Photoelastic Technique to Visualize Stresses

By Robert Cookman

Pittsburgh—Westinghouse Electric Corp. is using a three-dimensional photoelastic method for obtaining a picture of the stresses in solid parts. Stress lines are frozen in the plastic when the part is cut and examined under a polarized light the stress patterns are visible.

This enables a designer to visualize and understand the stresses in a solid part too complex to handle by purely analytical calculations.

It shows how where the part is likely to fail and should be strengthened and where it is overstrength and can be lightened.

Developed by Milton M. Levin of Westinghouse's Research Laboratories, the method extends conventional two-dimensional photoelastic stress analysis to three-dimensional. It does this by rotating the three-dimensional part to two-dimensions. Because the stresses in the three-dimensional part are frozen in, the part can be sliced into thin sheets, the two-dimensional patterns of which can easily be analyzed.

In the example pictured, a one-fifth

scale model of a nuclear reactor pressure vessel was finished machined from a cast epoxy resin block. It was placed in an oven and the temperature raised to 100°F.

The scale 3.25 psi pressure-transmitting liquid was applied through a tube leading through the pressure vessel wall. While the material was in the oven, the vessel temperature was slowly reduced until, two days later, the temperature was back to normal room temperature. The pressure was then released but the stresses remained "frozen" in.

### Simple Slices

The flat samples sliced from the model after it was removed from the oven show (below) curved with polarized light the stress-optic patterns which were experienced by the sample elements where they share the imposed stresses with their neighboring elements as part of the original solid. The patterns in the slices are not only straight-forward but are interpretable to quantitative analysis.

The method of quantitative photoelastic stress analysis is to work from



known stress to other known areas. For example by coating the interference lines between the sliced part to the known edge stress is a gradient which is analogous to bending gives the calibration value of each interference line which can then be used into other more complex areas.

A drawback of this system for the pressure vessel, Levin said, was due to discrepancies in Poisson's ratio in the pressure vessel walls.

The higher Poisson's ratio for the model (0.3) as against 0.3 for the prototype caused higher circumferential bending stress in the walls.



## Military Suggests Reliability Remedies

New York—Avionics, despite great strides, has not kept pace with the demands imposed by advances in communications, propulsion and weapon system complexity, says military and aviation leaders, warning that a gap exists in the current Avionics Observer data meeting here.

Further complaints about avionics equipment reliability, complexity, size, weight and cost were accompanied by specific suggestions for improvement.

• **Function integration.** Large gaps in space and weight can be made by integrating redundant functions found in deficient equipment. Col. Gordon T. Gould, Jr., told the ADM, Gould is chief, Communications and Electronics Division, Headquarters Air Research and Development Command. Pointing to the rapid growth of avionics equipment aboard aircraft, Gould said that much of it has come from computers and functions that could be eliminated by more complete systems engineering.

• **Reliability.** USAF has established a program aimed at qualitatively measuring the degree to which its contractors are aware of latest state of the art and are putting it into practice, Gould reported. Proposals for development must touch each new contract as well as the progress the contractor intends to pursue to achieve reliability, with various project reports on its reliability program. However, Gould said, his mission effects even a quantitative basis for measuring and evaluating reliability is needed.

• **Weight and size.** Gould also noted as a major problem of equipment being which will reduce both initial and long-range quality. Gould said.

• **Cost Reductions.** Complex new systems are putting themselves out of the market. Gould must move down, he said the winning solution by Rear Admiral Ramsey Bennett, chief of Naval Research. The solution, as Adams Bennett said, is more automation. However, such automation must be designed for development and short-run production.

• **Better Management.** Order of magnitude changes in the quality of military-industrial management of defense programs is needed, according to Adams Bennett. "We must do better in defining what we're doing, a good enough for the job," he said. "We cannot go on forever piling the 12s, polluting the chrome, demanding the best, the best, regardless of cost where we cannot find it."

Speaking as an active military representative, Daniel B. Noble, vice president of Motorola, said that as a result of the tremendous growth in the number of tasks which systems engineers have been asked to perform and the increased complexity of these tasks, we have seen of late the two but in general the overall quality, quantity of refinement and improvement in reliability in field operations. Noble said.

### Program Challenge

"We can agree with sound reasoning that this program... has been essential... to meet our potential future challenges in the field," Noble said. Its basic pattern of defense and strategic protection of our country. Noble said.

"We can also think God that we have been... faced with the necessity for placing thousands of such types of the hundreds of electronic systems in successful operation on a war basis of daily field operations. We would not be faced with the same collapse of our broad front of electronic capability."

"I would like to see a shift in our current emphasis on reliability and cost to a more realistic operation on a war basis of daily field operations. We would not be faced with the same collapse of our broad front of electronic capability."

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Noble listed the three elements which he believes are required to solve the reliability-maintainability problem.

• **Use of modular and submodular construction** to permit maintenance in the situation of the field.

• **Test procedures, coordinated with a modular construction plan,** which permit specific identification of failure sub-modules.

• **Proven circuitry, automatic assembly and solid modular construction** to improve uniformity and production and to protect component in the field from environmental mismanagement.

• **Transmission lines which are possible to**

eliminate common faults, making possible under use of solid modules.

### Agreement on Concept

Gould expressed agreement with the concept of modular packaging for specific field loading and equipment repair. If modules can be made too small, the "throwaway" module becomes feasible, he said. Gould also said that reformulated manufacturing techniques can improve maintainability and reliability.

"The level of training of our maintenance personnel has not kept pace with the increasing complexity of our electronic equipment and there is little likelihood of doing the job," Gould said.

The USAF has no fluency about the possibility of eliminating component, but he said there is much that can be done to make it easier to be with complexity, he said.

"Now testing techniques and good test equipment are part of the answer," Gould said. "But are not entirely satisfactory when the test equipment becomes so complex that it requires special test equipment to test the test equipment."

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equipment. He also noted that the Army is making "maximum utilization" of resources to save available development.

### Minimization Problems

Although panel speakers stressed the need for more automation, several noted problems which now stand in the way of such transformation. For example:

• **Transients,** whose small size usually is considered to be a good thing, are difficult to handle and place automatically in parallel error loads because of their small size and complexity.

Col. Meyer and He called for more efforts to permit automatic placement of transients in parallel error loads.

• **Prevented maintenance** was also applied to Adams Bennett to some degree which was not recognized and compensated that greater skills and experience are needed to manufacture and/or repair them.

Adams Bennett advised that such equipment "may need written specifications, but it does not require complex ones."

The importance of specifications must be brought to the attention of the military, he said, top management in sufficient time, he warned.

However, Adams Bennett pointed out that new techniques now permit equipment solutions without the adverse high cost construction or critical maintenance.

For example, he cited a new

integrated airborne digital computer which weighs 35 lb and occupies only 0.6 cu ft. It replaces a number of separate analog computers whose total weight is 114 lb and whose size totals 32 cu ft.

Despite its small size, the device is complexity two computers in parallel which should provide increased reliability, Adams Bennett said.

Although he did not identify the computer, he said he has been referring to a new airborne digital computer, called "Vortex," developed by Philips. The device is currently in delivery to the Navy for evaluation.

## Datamation Industry Aims for \$10 Billion

New York—The datamation industry is turning out more than a billion dollars worth of computers and electronic data processing equipment annually and should hit \$10 billion before coming a station point. This prediction was made by Dr. H. T. Engstrom, executive director of the Eastern Joint Computer Conference, Engstrom is deputy director of research for the National Science Agency.

Another prediction, that solid state devices such as transistors, diodes and diodes will replace vacuum tubes in all but extremely high temperature applications, was made by the Conference Chairman, James R. Water of Rong.

Dr. Engstrom criticized the datamation industry for over-optimistic estimates on delivery and performance of new equipment. "It is better to have equipment on time, even though it may operate at only one-half the speed which may be technically feasible," he

said. Rong, Division of Space Research, said. The prediction was substantiated by the large number of technical papers given during the conference which described new computer solid state devices and concepts.

The use of solid state devices is plain of vacuum tubes should provide a significant improvement in computer reliability, according to Robert Campbell of Dornier, Campbell also predicted that airborne data would come down with the use of datamation techniques to maintain computer subminiaturization.

The next five years will see computer whose capabilities exceed those of present designs in the same field as present computers on business, the old mechanical calculator, according to J. F. Baker, Rong, Division of Space Research. Baker said that a machine called LARG, now under development for the Army, Navy, Coast Guard and the Navy, is not LARG will be delivered in 1973.

Baker also predicted that the use of automatic programming techniques will make it possible to simplify computer design without its cost.

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**Dozens A4D Stresses Simplicity**

Delivered here by Douglas A4D jet bombers in Navy operations in the Atlantic and Pacific fleets, following completion of Fleet Introduction Program Trials at the Quonset Point, R. I., Naval Air Station (AFW Ops, p. 71). Sealed and lighted, the A4D could perform A4D as designed with maximum number of parts and good management for ease of maintenance. A4D made good availability record in F1F trials, Douglas reports.





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FOR TESTING IRON-CONSTANTAN, COPPER-CONSTANTAN OR CHROMEL-ALUMEL THERMOCOUPLE INDICATORS AND ELECTRICAL RESISTANCE THERMOCOUPLE CALIBRATING TO THE AN-6-19 OR AN-3-31 TEMPERATURE-RESISTANCE CURVES.

FOR USE IN THE TEST LABORATORY ... OR IN THE AIRCRAFT

**the LEWIS ENGINEERING COMPANY**  
naugatuck, connecticut

said. Dr. Engstrom also criticized the industry for goodkeeping of engineering and technical personnel, with a resulting spread in salaries and experience variations.

However, he concluded that the defense industry had made tremendous achievements in the past decade and was in expected better shape.



## Lear Will Introduce Transistorized ADF

Lear has announced a new all-transistor automatic direction finder weighing only 154 lb., believed to be the lightest transistorized ADF. It will be available shortly after the start of the year.

The new Model ADF-100 operates directly from 18 volts d.c., consumes only 0.5 amp. Receiver comes in a 4 ATR case size. The new ADF provides continuous coverage over three bands: 198-495 kc., 400-850 kc., and 808-1,201 kc. The accurate control head, with edge-lighted panel, provides bearing and course controls, function selector, CW switch and a two-speed manual loop rotation switch.

The ADF-100 includes a four-direction loop antenna, horizontally rotated on swivel indicator, available with either fixed or rotating coils. Receiver sensitivity is quoted at 10 microvolts on bands one and two, 15 microvolts on band three, for 50 cps, except at 0.5 db signal-to-noise ratio. Average selectivity is quoted as 5 kc. at 0.5 db, down to 3 kc. at 40 db down.

Lear says the new ADF has been designed to comply with CNA and Radio Technical Commission for Aeronautics requirements.

## Components Industry Could Meet Demands

Washington—High-temperature, high-stability, sensitive and capacitor needed for aviation applications might prove a bottleneck in event of aircraft mobilization, but otherwise the U. S. components industry is confident it could meet expanded needs.

Resistor, capacitor and relay manufacturers' representatives, meeting with Business and Defense Services Administration (BDSA) officials recently to discuss mobilization requirements, were considerably more optimistic than quite exact mobilization needs were at an earlier meeting (AW Day, 3, p. 107). Highlights of the industry groups' reports are as follows:

• **Resistors.** Growing need for resistors capable of withstanding high temperatures, shock, vibration and other rugged environmental conditions might substantially reduce the industry's ability to produce in the quantities required. In some instances, military specifications lag behind present state-of-the-art and as a result, many aviation equipment makers now are using their own specifications. The resulting multiplicity of specifications for the same item is becoming a burden on the industry.

To ease this problem, it was recommended that the Armed Services Electronics Agency (ASEA) be given the authority and staff to develop industry specifications for aviation where we would be competitive. Industry spokesmen expressed concern over potential shortage of fine sizes of resistor and resistors were needed most since wire, precious metal contacts, small precision bearings and other materials used in resistors. BDSA promised to investigate the recommendations.

• **Capacitors.** Increasing demand for high-reliability types for aviation applications will reduce substantially the industry's ability to meet mobilization requirements.

Such components require procurement of long lead-time testing equipment and having and training of skilled technicians. Both require heavy loads on resources of small and medium size companies. Spokesmen expressed concern over possible shortage of materials, personnel and, most critical, space for test paper and test chambers, in event of mobilization.

Relays. Deficiency in industry capacity to produce aviation types of relays, disclosed by Government survey made in 1951, has been overcome by facilities expansion since the survey was made, according to industry representatives. With additional expansion now under way, industry representatives stated, mobilization would undoubtedly be met without mobilization needs.



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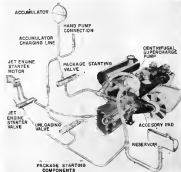
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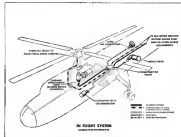


## Pack Adds to Helicopter Self-Sufficiency

By George L. Christman



SCHEMATIC of the Vickers power pack shows hydraulic engine at the back during front-mounted pump which supplies pressure to jet starter motor.



SOME of the many services which the power pack can operate on shown. Included are rotor on main rotor (for autorotation helicopter), main drive, and alternator drive.

New York—Gasoline engine driven power pack, designed to make helicopter self-sufficient, has been developed by Vickers, Inc. It is small and light enough to install in large helicopters.

The unit can supply power to start engines, raise the helicopter with rotor folded, drive electrical generating equipment, operate loading ramps. It will allow helicopters to operate from additional bases and inaccessible locations where ground support equipment is not available.

It will give helicopters the added advantage of not having to idle their engines to supply power for auxiliary services.

#### Prototype Unit

Breadboard prototype of the unit has been built with power output capable of starting the Allison T36 turbine engine.

LM, a recent meeting here of the American Society of Mechanical Engineers, helicopter manufacturers stated that many of their future concepts resemble the T36.

Small helicopter engines can normally be started on the ship's battery without assistance from external power sources. In the time engines get as big as the R3600 and on the Sikorski S-56, additional power must sometimes be used.

When the T36 becomes a helicopter powerplant, an external power source will be needed.

Vickers recently took its power pack to Allison's plant at Indianapolis and used it to start T36 engines, with and without propellers.

The T36 currently is being used as powerplant for the Lockheed C-130 and later will power the Lockheed Electra.

#### T36 Start

The engines were turned over by Vickers hydraulic system equipped by the power pack. Vickers engineers told Associated Press that the popliteal T36 started in 10.1 sec, the popliteal-equipped T36 in 48-41 sec. Allison officials reported the start in satisfactory, Vickers said.

There are other important considerations in making a helicopter self-sufficient for combat conditions.

• **Consequence.** Helicopters with its rotor blades in manual position is very difficult to maneuver because of the dis-



FIRST PICTURES of a hydraulically-powered, two motor mounted on the main wheels of a Sikorski H-25B helicopter. Device is used to turn the machine when its rotor blades are folded. Forward speed and turn are controlled through main engine which drive gears powering individual motors. Units may be quickly removed from wheels when not needed.

tinctive rotor pattern and because of the large rotor disc area which must be controlled. These considerations, which parallel the necessity of streamlining a helicopter's profile as much as possible for high-speed operations and storage, make folding rotor blades a necessity for large machines. The pack can supply the power necessary for blade folding.

• **Mobility.** When operating in the field a helicopter must be able to turn over with its blades folded. Sikorski's S-56 two engine gasoline has tested hydraulically-driven power units at 100 ft to its main wheels which enable it to turn independently of the rotor.

• **Weight saving.** Power pack including plumbing and controls for a two-engine helicopter weighs about 115 lb. Wally wheel drive, the weight goes up to about 224 lb. A typical gas turbine engine on a new large helicopter will have about 613 lb of fuel per hour while flying.

#### Weight Economy

Thus the ability to shut down and start engines without the assistance of ground equipment affects fuel and therefore weight economy.

Other services which the pack can power are lowering and raising loading ramps, driving hoists or winches, pro-



HYDRAULICALLY-DRIVEN, 1 in. also now developed by Vickers for self-sufficient helicopters.

#### Standard Equipment

Standard Vickers Work that has been developed for standard equipment only on Navy models of the two-engine helicopter designated H-25B. The drive will usually be a part of deck equipment mounted by the carrier and used to turn the machines when their rotor blades are folded.

ing rotor on conditions in autorotation helicopter, running electrical gear drive equipment for communications, work and for lighting, and supplying emergency weight power should normal power sources fail or become battle-damaged.

Vickers officials said their hydraulic power pack is lighter, smaller, and more efficient than other auxiliary power sources of equivalent power output such as gas turbine engines. They cite additional advantages of the hydraulic power pack: initial procurement costs are lower, it is less susceptible to environmental conditions, more reliable in service, and it is easier and cheaper to maintain because major components are known and understood by most maintenance personnel.

The Vickers hydraulic power pack is driven by a 22 hp McCulloch four cylinder opposed air cooled engine (A General Electric spins its engine was tried, but was too heavy). Two belt drives have been cooling on over the cylinder engine and pressure weight 78 lb.

#### Engine Drives Pump

The engine drives a Vickers variable displacement pump which supplies hydraulic pressure to a selector valve. The selector valve is directed from the selector valve, hydraulic power is supplied to any of the services previously listed.

Completing the system are fuel tank of about 1.5 gal. capacity for the engine, 100 cc in capacity hydraulic fluid reservoir, hydraulic motion accumulator, and necessary valves, plumbing and controls.

Vickers considers it an advantage to be able to maintain the main hydraulic pump to start the gasoline engine by connecting it with power stored in the accumulator.

The accumulator will provide power for an almost indefinite number of starts because, as soon as its stored energy is dissipated, a hand pump can be used to pump it again quickly. This unlimited starting capacity, in effect guarantees the helicopter's ability to take off from wherever it lands. An other weight-saving feature is that the

#### Weight Breakdown

Here is the estimated weight breakdown in Vickers' powerpack for a two engine helicopter.

Engine with Governor	70
Shaft	10
Hydraulic Accumulator	5
Cooling Fans	3
Fuel Tank	2
Fuel Oil (1.5 gal.) for estimated 25 starts	9
Hydraulic Fluid (173 in.)	5
Reservoir (180 cc in capacity, filter, relief valve, and flow sensing valve)	5
Selector engine selector valve and manifold (two piece)	6
Plumbing	1
Power Pack Total	150
Selector Valve with Governor Drive	17
Total Static Weight (two per helicopter)	14
Total Weight for two-engine helicopter	264



single pump serves in two units—static and pump.

Victors said that the power pack was developed with the F35 starting power requirements in mind. Other services provided by the pack would normally require less energy. However, under all-continued periods of considerably different power outputs could be made available without difficulty.

Victors has hopes that at least two types of helicopters will use its present power pack.

Currently Victors has only the single, breadboard model available. The unit was developed entirely at company expense.

## OFF THE LINE

**Flomco Corp.**, developer and manufacturer of Euthe metal hose and associated products, has received Flex-O-Tube Division of Morden Corp. Flex-O-Tube makes couplings and hose assemblies in rubber and plastic. Flomco's home office is in Marwood, Ill.; Flex-O-Tube is in Inkster, Mich.

Four sets in the motor, wearing aluminum aluminum parts, have just received a stainless-steel finish from a rock airplane line at Chicago's Midway



**Argot** The sets are wearing air type equipment under the tank. Set number, named Fire King, is manufactured by Whittaker Protective Apparel, Inc., Chicago 11.

New 2,000 lb. capacity lift truck features greater power and fast, easy operation. It is powered by a 4-cyl. air-cooled engine which may be operated from conventional or LP gas. A counter-actuator transmission assists long



life and smooth driving. The truck may be equipped with new, optional attachments to increase its versatility. Model 40C, the vehicle is manufactured by Hyster Co., 2801 N.E. Chalmers St., Portland 1, Ore.

More than seven miles of underground pipe connecting the hot water heating system is currently being installed at New York International Airport is being protected with Gildrite insulation. The gildrite encased a panel around the pipes and lines in them when they become hot. It acts as both a protective coating against underground corrosion and also as an insulating medium.

Switch line, Victors to New York Air Brake hydraulic pumps was made by Lockheed Aircraft Corp. on its new 1045 Super Star Conclusions All previous Conclusions models, from the original 695 to the current 6945, used four Vitruvius pumps in the main source of hydraulic power on the airplane, one pump being mounted on each engine. The new installation will also include four pumps called Stratosphere 6945C series. Lockheed increased the hydraulic output's operating pressure from 1,750 psi to 1,800 psi on the Model 1045.

An Power will serve more than 1,800 portable Spun electronic engine analysis under a recent \$1,284,000 contract. Use of portable engine and other manufacturing improvements has kept the weight of these air-cooled models to the same 35 lb. the other



units weighed. Instruments, which include 1 in. overflows, will be used at all USARF air bases which have portable engine units. The Power's portable engine places 16 about 6 million hours yearly, almost twice that of jets, according to Spens.

## B-58 Uses Bonding in Primary Structure

Portions of the Convair B-58 Hustler aerospace bomber's primary structure is bonded using an end-to-end assembly on conventional bonding adhesive.

Use of the bonding film is a part of much results in greater strength for the primary structure on which it is



used, according to Convair. The company says that use of the concept also makes possible substantial weight savings and more efficient manufacturing procedures.

The aluminum-to-aluminum bond produced by the adhesive is sufficiently vibration and heat resistant to make its use on the B-58 feasible.

The bonding film was developed by Convair and the E. F. Goodrich Industrial Products Co.

PIONEERING is our business



## NEW BENDIX TRUE MASS FUEL FLOW SYSTEM APPLIES ANGULAR MOMENTUM PRINCIPLE WITH SINGLE TURBINE

Increased accuracy and greater reliability are the two big advantages of the new Bendix Single Turbine Mass Fuel Flow Transmitter designed for engine application in both single and multi-engine jet aircraft. (Type 1155 Transmitter is shown above).

The accuracy of the Single Turbine Type Mass Fuel Flow Transmitter is within 1% of actual flow, regardless of flow rate, type of fuel, or environmental conditions. The new, single turbine is responsible for this greater accuracy because of its reduced friction, reduced fluid coupling, and its sensitivity to aircraft accelerations.

The simplified design and fewer parts of this Bendix engine measure-

ment transmitter also make possible longer, more trouble-free service life, and its use is measure flow in either direction.

Other advantages: low pressure drop, light weight, available in a variety of flow ranges to fit the application.

While this transmitter is new, it fits into a variety of systems—both new and old. Ask us for publication No. 16-217, PIONEER-CENTRAL DIVISION, BENDIX AVIATION CORPORATION, BALTIMORE, MD.

Write: Bendix Division, 117 E. Philadelphia, East Ave., East Bend, N.C. or Bendix Division, 117 E. Philadelphia, East Ave., East Bend, N.C. or Bendix Division, 117 E. Philadelphia, East Ave., East Bend, N.C.

Pioneer-Central Division







**SUPERCHARGED E50** Twin Bonanza with top speed of 240 mph, still below, of Beechcraft's ace, took in 1976 sales campaign



**BONANZA B15** has more powerful engine delivering 240 hp, eight place E15B (below) has range increased to 1,626 mi. with turbo.



## BUSINESS FLYING

### Beech Aims for Sales of \$46 Million

By Edwin J. Telian

New York—Business aircraft sales of approximately \$46 million will be aimed at by Beech Aircraft Corp.'s distributor-dealer network in 1977, a goal topping the \$43 million in domestic and export business handled in the sales year actually concluded (AW Dec. 17, p. 36).

As a measure of the fast-growing rate of the business aircraft market, Beech spokesman note that the 1976 sales rose to 417% increase over the company's 1970 total. U. S. commercial sales, which reached \$34 million last year, have more than doubled in the last two years, compared with \$55 million achieved in 1974.

Shown in approximately 300 Beech distributor, dealer and sales representatives from the U. S. and 38 foreign countries at its annual sales meeting in Wichita, Kans., earlier this month, was the 1977 1966 Aero-center line including the new supercharged version of the Twin Bonanza, a high-powered Bonanza and its improved Super B.

#### French Jet

Formal announcement of the new Model 55 Travel Air light jet is expected to be made in March. Present plans include a nine-month test. Still active in the company's future planning is the two-seat Mooney-Southern MB-700 Plus.

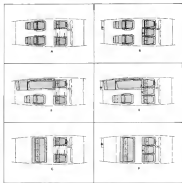
This airplane was referred to the U. S. by Beech and demonstrated last month to the airlines at Washington and Norfolk, Va. The company is primarily interested in selling the Nova MB-700 as a non-transportation business jet for pilot applications. Should a military production contract for the airplane be forthcoming, chances are good that Beech would also offer it as a light-speed business plane.

Beechcraft's fast production plant powered with supercharged engines, the new E50, has a top speed of 240 mph, and cruises at 235 mph at 75% power of its two six-cylinder 340-hp Lycoming C96C450-A1A5 engine. It has a service ceiling of 24,000 ft.

The company is also offering the D50 model of the Twin Bonanza having high-compression Lycoming GO-440 C126 engines rated at 245 hp in takeoff. Top speed of the D50 is 201 mph at 75% power; cruise speed is 206 at 65% power. The company reports direct operating costs, fuel and oil, of \$13.96/hr. for the



**VARIETY OF SEATING** is possible in 1975 Twin Bonanza offering a coach and E15B-type class. Diagram below shows six layouts possible; alternate storage of stowable seats and back. Captain's seat shown to left in arrangements A, B and C.







**SUPERCARGED** 140-hp. Licensing on E30 is expedited by lifting quick-opening cowling. Retractable prop (right) options former model unit.



E30 and \$21,440 for the D50.

The E30, at maximum gross weight of 7,900 lb., climbs at 1,620 fpm at sea level compared to the D19, which at 5,320 lb. gross, climbs at 1,450 fpm. The E30 uses 940 in. of ground roll for take-off with 19 deg. flaps, lands in 1,230 ft. over a 50-ft. obstacle. The D50 gets off in 995 ft., with the same amount of flap loads in 1,160 ft.

#### Seating Arrangements

In addition to the new engines made available on the 1977 Twin-Bonanza customer has a choice of one of six seating arrangements and wing and Super 18 tailwheel choice. "Aeroflex" wing arrangement is a new instrument panel arrangement. Previous Twin-Bonanza had a "bulk" panel in which the instruments were subintegrated, the new version has flat-

mounted dials, permitting more with torso grouping and installation of a greater variety of equipment.

Because of increasing installation of radio and navigation equipment on business aircraft, Beech in 1977 is providing three optional radio packages for the Twin-Bonanza installation.

• **Package A**, at \$4,375 and weighing 57.7 lb. Aircraft Radio Corp. V20 18-channel VHF transmitter, ARC 15D radio, Twin-Tone CA-1A audio amplifier, Lear 2117A VHF antenna and microphone and headset.

• **Package B**, priced at \$7,725 and weighing 99.1 lb. is installed. Norel Synthesizer 1016 30-channel VHF transmitter, ARC 15D radio, ARC T20 20-channel transmitter, Twin-Tone CA-1A audio amplifier, Lear 2117A VHF antenna and microphone and headset.

• **Package C** costing \$5,275 and weigh-

ing 99.9 lb. installed. Lear LTR-930 transmitter, ARC 15D radio, ARC T20 20-channel transmitter, Twin-Tone CA-1A audio amplifier, Lear 2117A antenna and microphone and headset.

Also available, factory installed, on the ARC type 21 ADF (53,775), Lear ADF R14 (\$2,425), Vite-Tone NR 1 marker beacon receiver (54875), Lear 2190B marker beacon receiver (57790), ARC type B31A low-frequency radio receiver (55725), ARC 15D radio for dual installation (51,120), Wilcox T08 B10 channel glidepath receiver \$1,515), and ARC CD-1 course director with matched compass system (\$2,125).

#### Wingway Price

Pricing, firming price for the E30 without radio is \$81,000; the 1977 D19 is \$77,000. A new 940-gal wing tank for the 5.30 costs \$2,515 extra, includes 46-gal. tankage on the D50 costs \$715. Both models include in their standard equipment the retractable wing which folds under the fuselage. This wing retracts when the fuel pressure on the right engine reaches a predetermined value upon automatic call when the fuel pressure goes off. To prevent inadvertent opening, in flight should the right engine fail, the wing cannot extend unless the landing gear legs are compressed in which the airplane is on the ground.

In line with the high altitude operation possible with the E30 equipment includes 700-hp. high pressure air outlet constant flow oxygen system. This is standard on the E30, optional on the D50.

A more powerful engine the twin-engine Cessna 441 Q45 is rated at 240 hp at 2,600 rpm for all operations, leads approach on the 1977 Bonanza Model 1435.

The new engine gives the E35 a top



**GRASS GROOMING** landing gear is being installed on majority of new E185 turboprops.

speed of 285 mph, and a cruise speed of 240 mph, the latter 6 mph faster than the previous model. Service ceiling has been raised to 79,000 ft.

In combination with the most powerful engine, the E35 also has a standard and optional Woodward Hydramatic propeller governor to maintain constant propeller speed.

This equipment replaces the previous electric governor, formerly offered as optional equipment, and a more efficient mechanism, a Beech distributor told Aerospace Week. Another powerplant feature is a new carburetor that automatically compensates for changes in altitude, providing improved fuel consumption and preventing engine icing.

Beech has gone to the package concept for the radio installation on the Bonanza. A new feature is the radio, the modified H15 with the \$22,650. This three package available for Bonanza installation include:

• **Package A**, weighing 27 lb. and costing \$1,305, comprises the new Norel VTR-11 Omegaplex VHF communications and navigation set supplied with 21 crystals covering a range of 118.1 mc to 122.5 mc, with microphone and headset.

• **Package B** costs \$1,900 installed and weighs 31 lb. It comprises the ARC T20 20-channel VHF transmitter, ARC 15D radio, ARC B20 marker beacon receiver, microphone and headset and ARC F-11 cabin altitude indicator.

• **Package C** is priced at \$815 and weighs 15 lb. installed. It consists of the Lear LTR-6 VHF communications trans set with marker beacon receiver low-frequency marker microphone and headset. This installation was standard and equipment on previous Bonanza and could be exchanged for a Norel VTR-11, if desired.

Optional radio gear offered for factory installation in conjunction with Pack-

ages A & B includes Lear ADF 12H (51,075) available with A or C, or ARC type 21 ADF (52,775) available with A or B, Norel VCR-1 Synthesizer available with A, and the Lear Omegaplex (5588), available with Package C.

A major advance change on the E185 is its independently adjustable fuel ratio. Previous models had a single set across the board, which was difficult to adjust in flight.

The 1977 E185, which sells for \$106,975 minus radio, features a range increase of 17% over earlier Sage 18. This is achieved by installation of 125 gal. of auxiliary fuel in two wing tanks, 47 each, than the previous tank on the model. Total fuel capacity is now 518 gal. The increased tankage gives the 1977 Twin-Bonanza a maximum range of 1,636

mi. with 45 mph. cruise in wind, pulling 200 hp from each engine at 18,000 ft.

Important new feature is inclusion of Genie emergency landing gear as optional equipment—\$1,900 extra. Beech initially announced the installation but never (AW June 21, p. 111). Responsive to this requirement is "non-availability," the company says, and it has been installed on 51 airplanes out of 58 deliveries through Dec. 17. The sales department feels that the large majority of new E185 buyers two-ports will be fitted with the Genie landing gear.

#### Dealer Benefits

Continuous development of a customer-pleasing stock by Beechcraft's sales department is evident in its growing library of financing plans to aid in moving airplanes. Evidence of this importance was the formation of the Beech Aircraft Finance Corp., in the period April through October, 1976. BANC assisted in moving \$1,214,000 worth of business aircraft.

Currently available through the company are financing plans permitting buyers to put down as little as 10% down in 36 months at 4% discount rate; 20% down payment, pay in 16 months at a 3 1/2% discount rate; 20% down payment, pay in 26 months at a 4 1/2% discount rate; 20% down payment, pay in 36 months at a 4 1/2% discount rate; or purchase/lease agreement on a business lease through American Leasing Corp. In addition, some Beech outlets have their own financing plans. Beech notes that its plans are intended as suggestions to dealers' options and not set not intended to replace their relations with local banks.

The company has planning arrange-



**NEW FLAME PANEL** on Twin-Bonanza allows more freedom in mounting equipment.



#### Auster Produces New Utility Plane

Latest Auster utility plane is the two-seater Auster Auster which is aerodynamically balanced airplane to improve handling qualities. Two models are available, one with a 145-hp. DHF Gipsy Major 16, the other a 170-hp. DHF Gipsy Major 1. Takeoff runs at 1,227 ft. gross weight at sea level is 270 ft. with 10 mph. headwind, and rate of climb is 1,074 fpm. Maximum certified speed is 128 mph, 340 ft. per sec. at 180 mph, with 32 gal. of fuel in 400 mi. Data applies to the 145-hp. model.



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# engineers:



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## Flight Loads Engineers

for Republic Aviation  
Long Island, N.Y.

A large increase in the number of models required at the flight test phase of development and as the complexity of the environment of flight tests has created some special ground level opportunities in this field.

(1) Flight load engineers at Republic are giving a high degree of effort. They will not limit the company's technical activities in this field to the minimum.

(2) Individuals in flight load are given a free choice of assignments. (3) The new Republic will give a member of the flight load staff a high degree of freedom in the selection of his assignments.

(4) The new Republic will give a member of the flight load staff a high degree of freedom in the selection of his assignments. (5) The new Republic will give a member of the flight load staff a high degree of freedom in the selection of his assignments.

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(10) The new Republic will give a member of the flight load staff a high degree of freedom in the selection of his assignments. (11) The new Republic will give a member of the flight load staff a high degree of freedom in the selection of his assignments.



## EMPLOYMENT OPPORTUNITIES

The above openings in this service include all employment opportunities in the following fields: **OFFICE, FIELD, SALES, AND SERVICE.**

**OFFICE:** **SALES:** **FIELD:** **SERVICE:**

**OFFICE:** **SALES:** **FIELD:** **SERVICE:**

**OFFICE:** **SALES:** **FIELD:** **SERVICE:**

## EXECUTIVE OPPORTUNITIES IN THE CESSNA SALES DIVISION

### REGIONAL SALES MANAGERS

- Executive management experience necessary in selling and administering sales programs.
- Experience in supervising and directing a sales organization.
- Aircraft background desired.

### REGIONAL SERVICE MANAGERS

- Travel out of and headquarters in Wichita.
- Aircraft maintenance background desirable.
- Must be competent pilot.

### PARTS MERCHANDISING MANAGER

- Must develop and administer a spare parts inventory program.
- Must be capable in setting up and operating parts departments.
- Must have automotive parts experience on same personnel level.

## CESSNA

If you meet these requirements and are interested in an unlimited opportunity with the Wichita Landing Program or Executive Aircraft, send your resume and recent photograph to the Personnel Placement Supervisor, Dept. AW, Cessna Aircraft Company, 5800 East Powers Road, Wichita, Kansas. (We check with you, please.)

## MECHANICS HELICOPTER

Helicopter maintenance experience preferred but not necessary.

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